THE American JOURNAL OF Surgery

JANUARY 1957

THURSTON SCOTT WELTON, M.D., EDITOR

Cervical Pregnancy

Chronic Ulcerative Colitis

Proctologic Papers Read by Title

SIXTY-SIXTH YEAR OF PUBLICATION

JANUARY 1957

THE American JOURNAL OF Surgery

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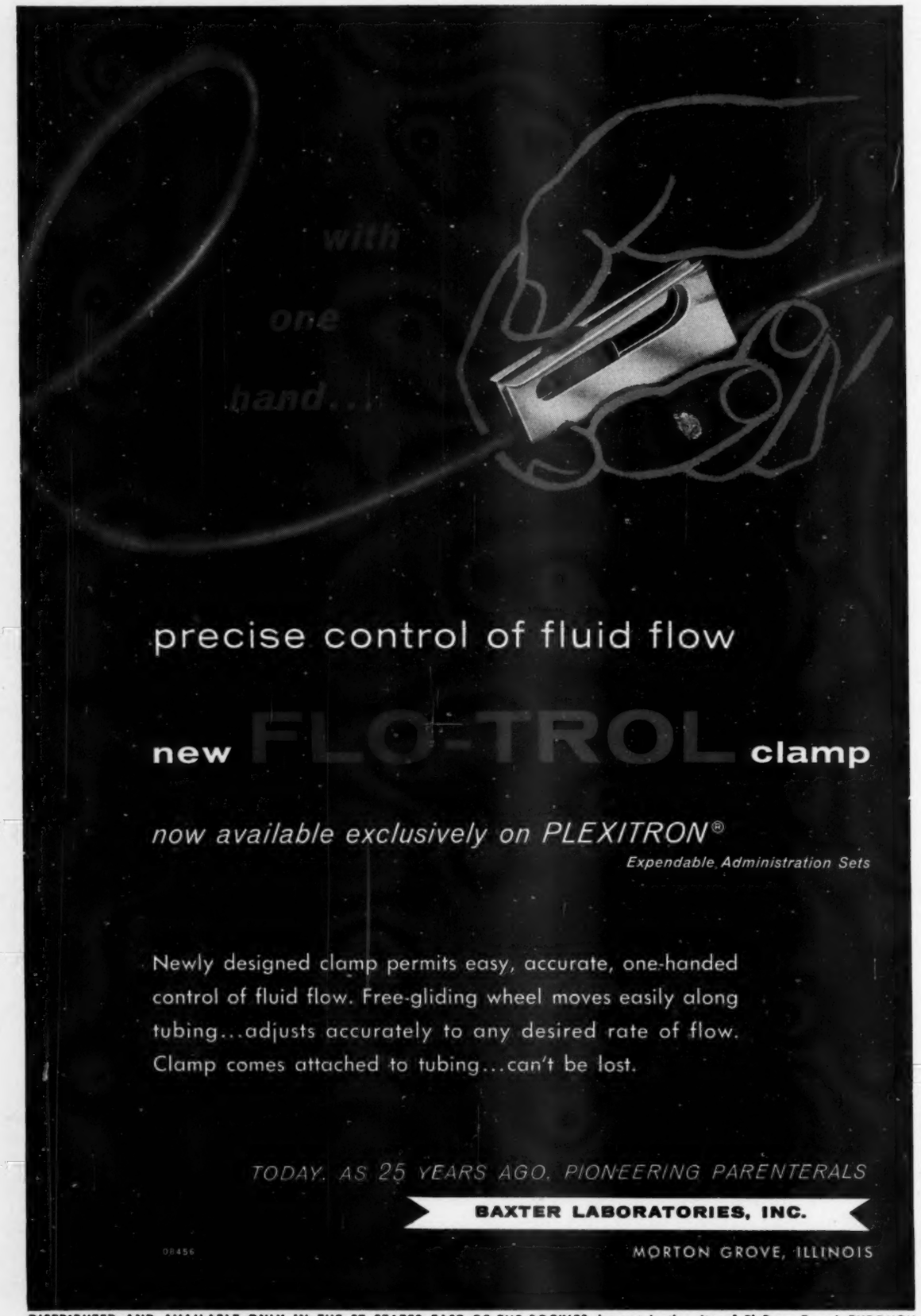

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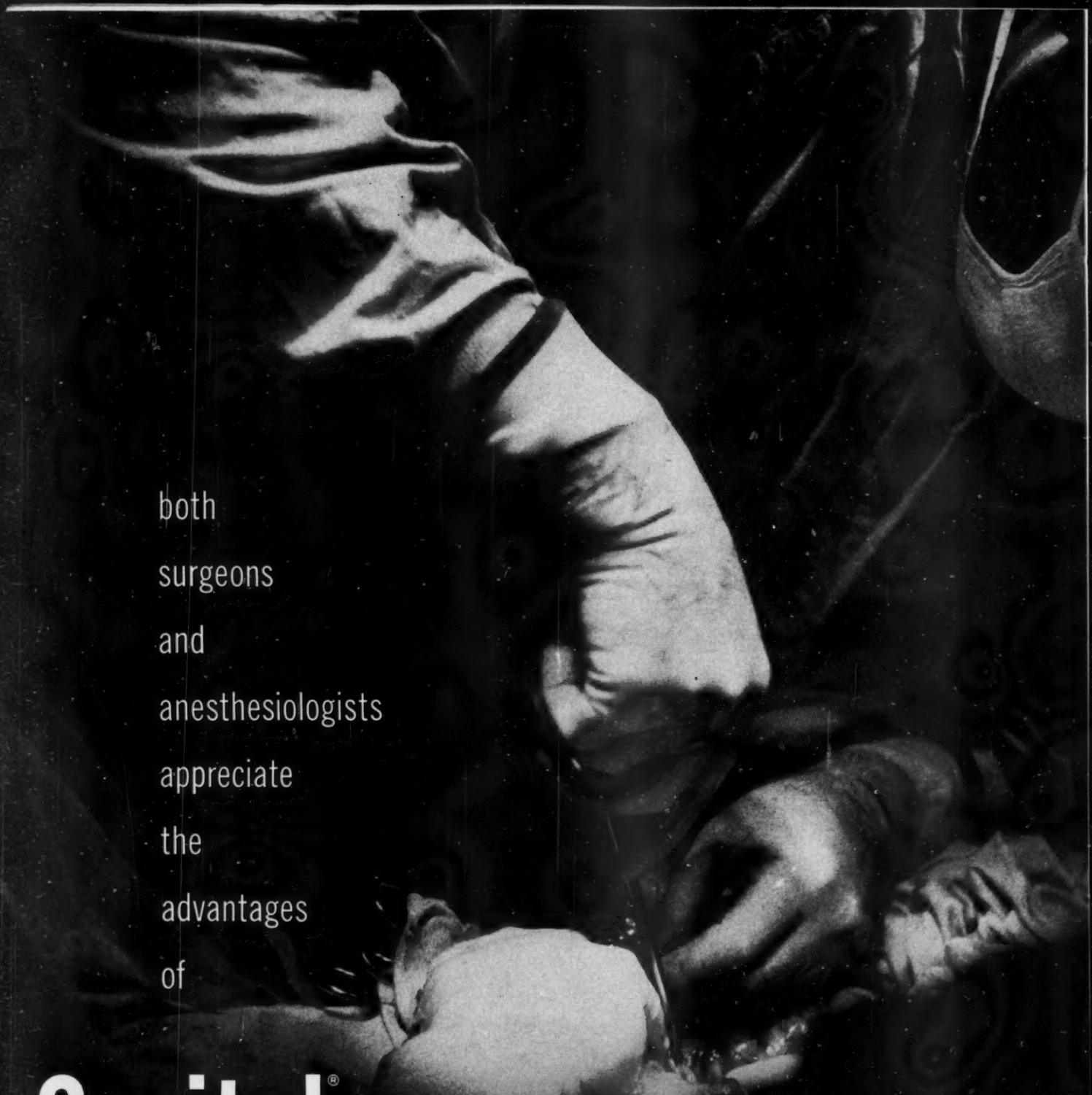

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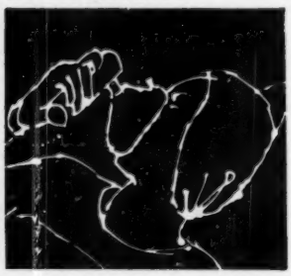

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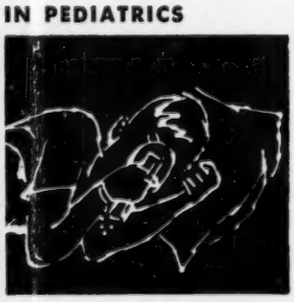

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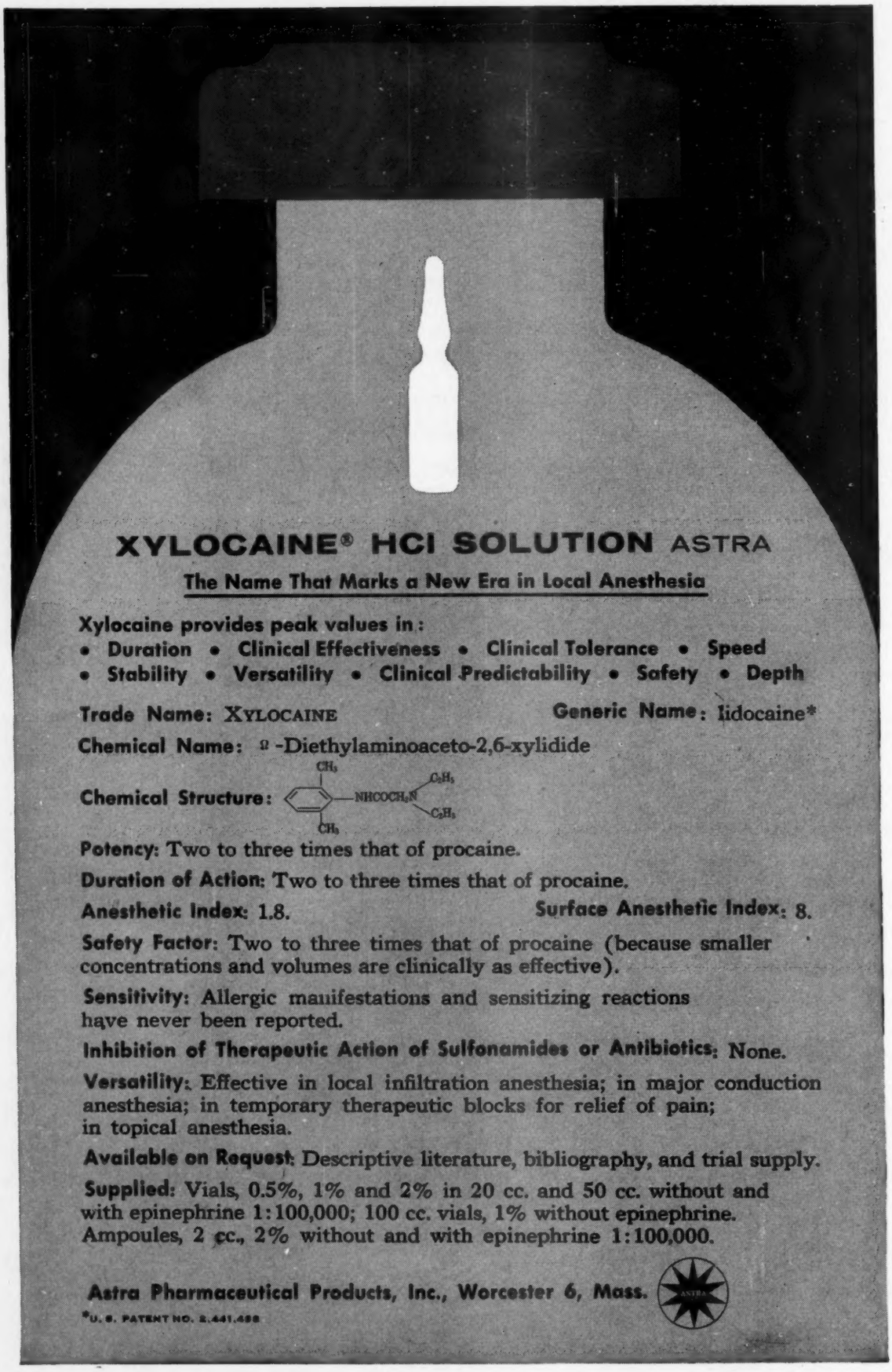

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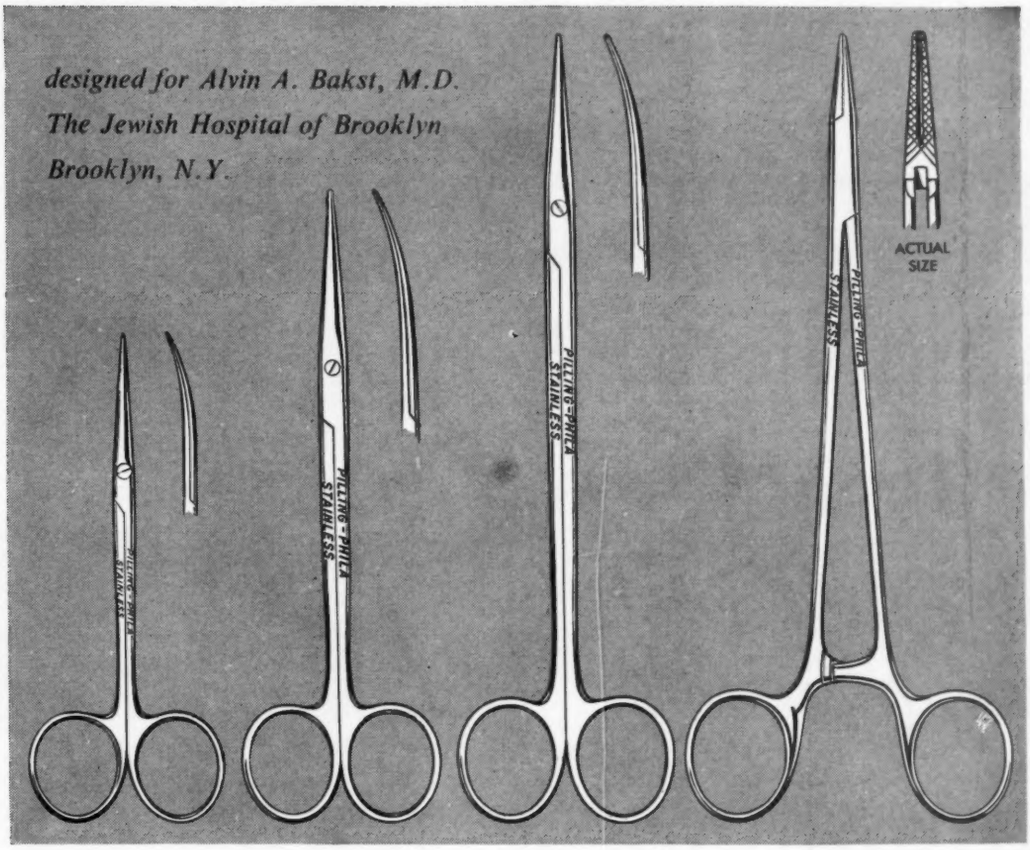

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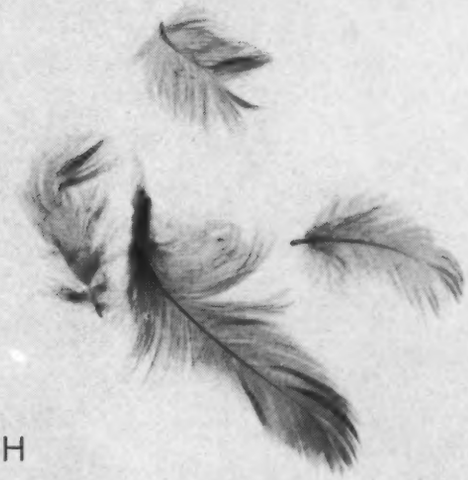

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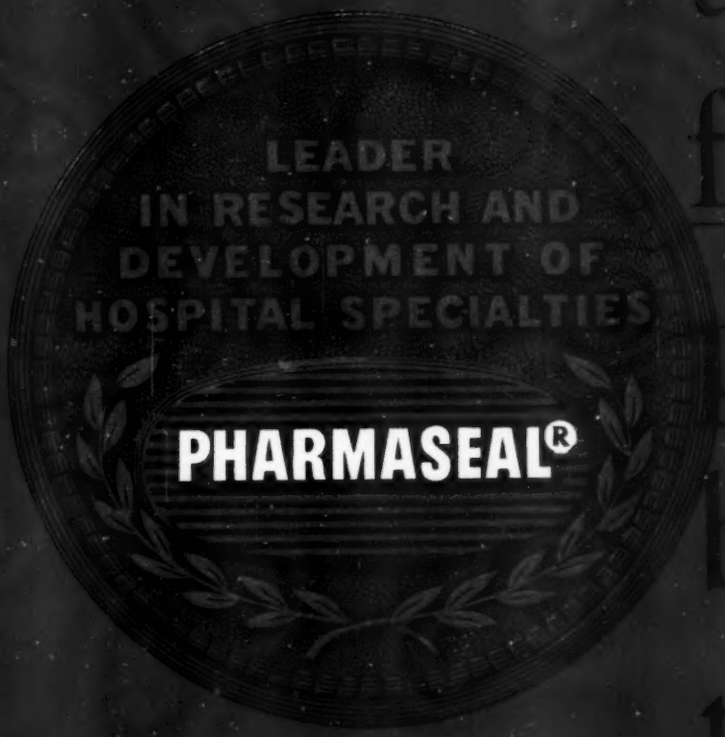

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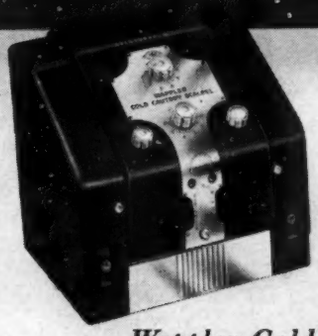

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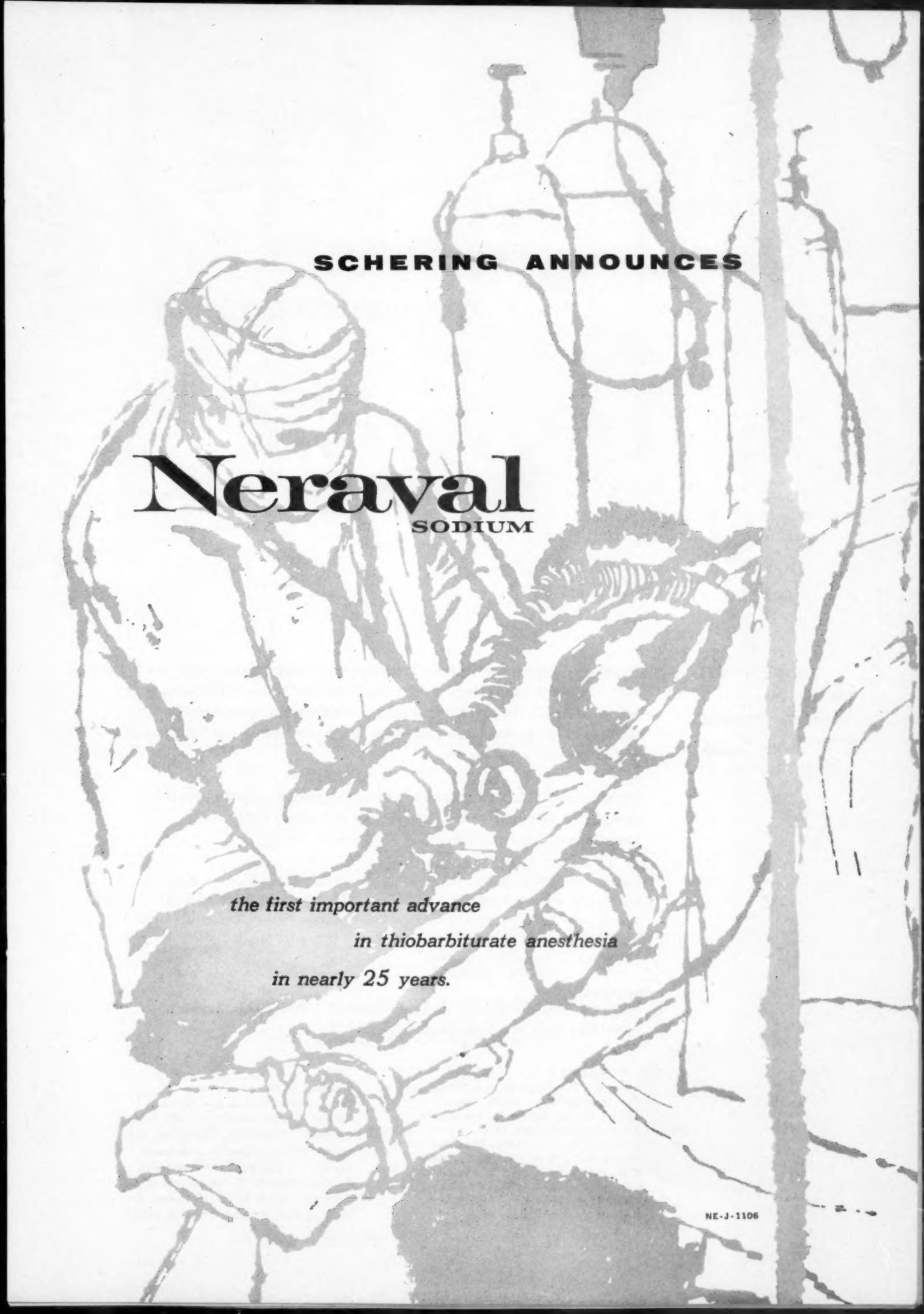
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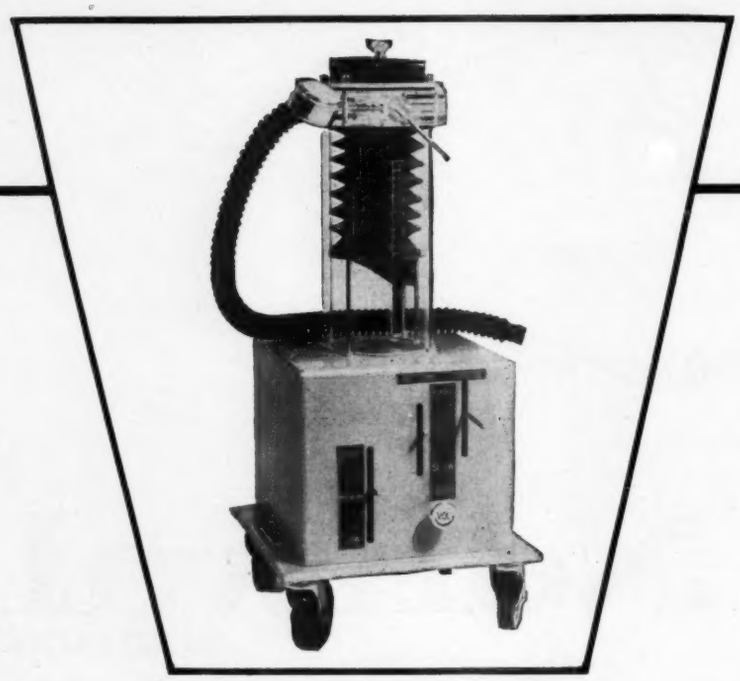

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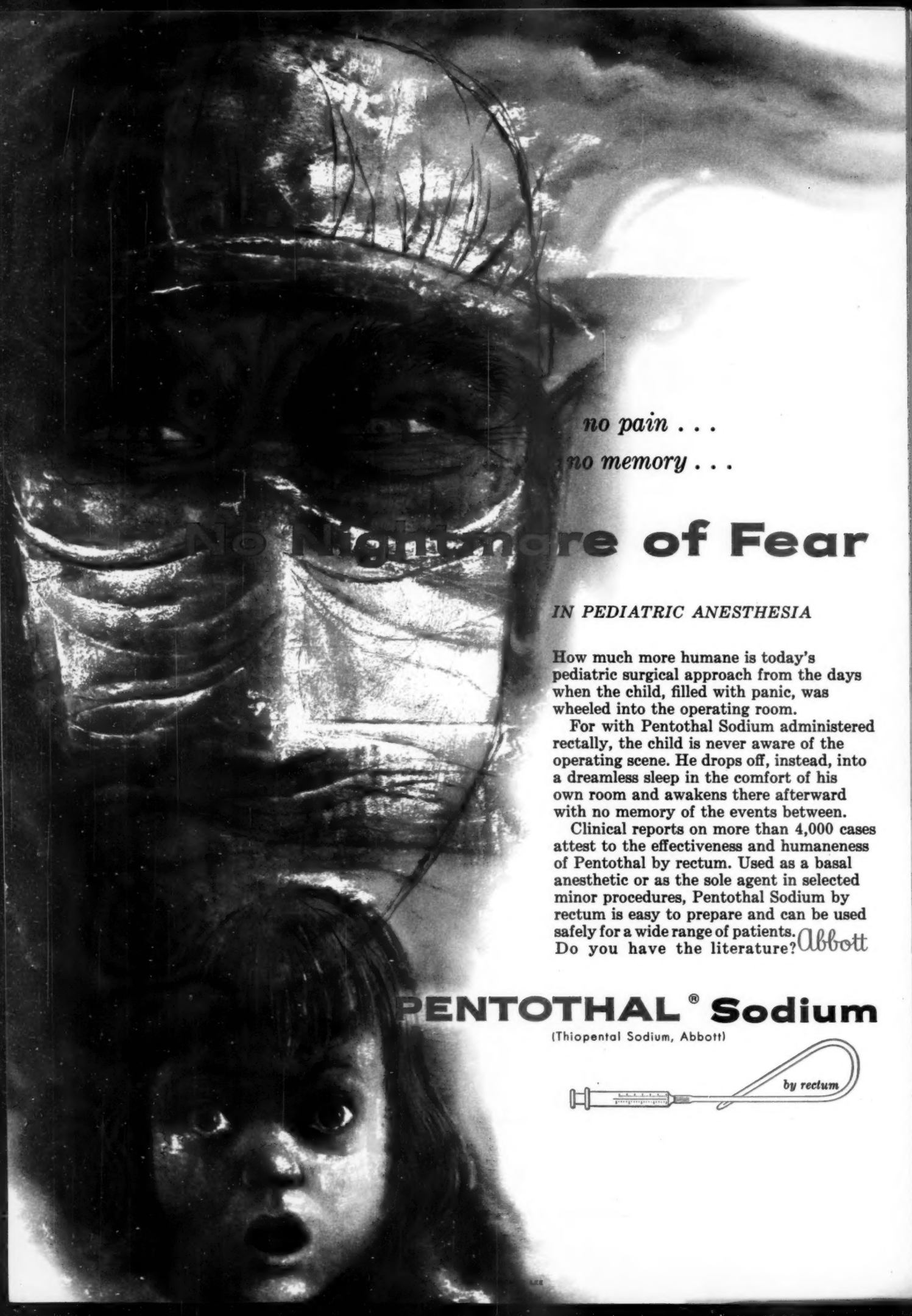

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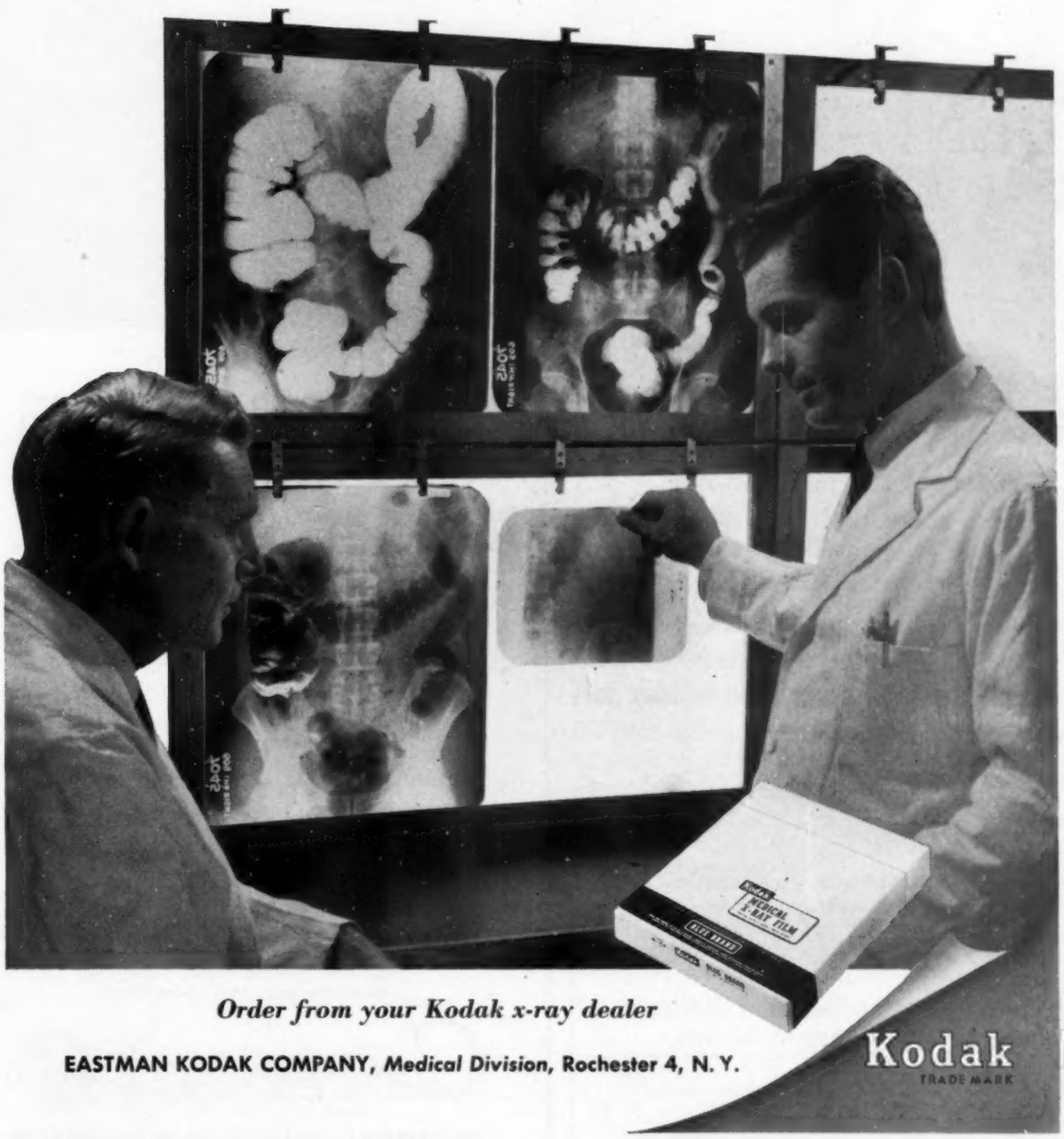

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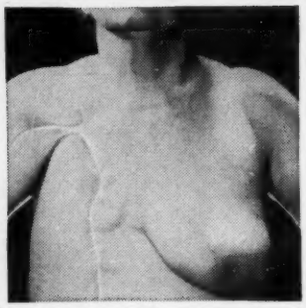

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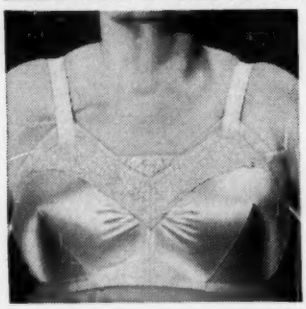

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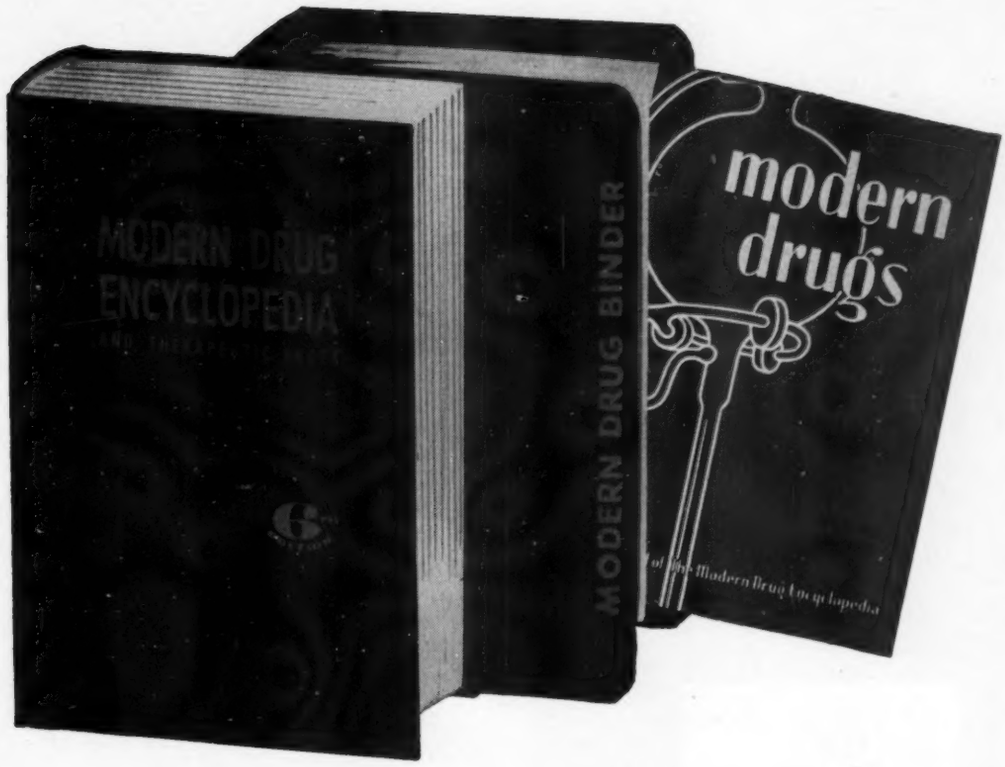

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The American Journal of Surgery

VOLUME 93 JANUARY 1957 NUMBER ONE

EDITORIAL

The Pitfalls of Abdominal Surgery

LATELY the words "needless surgery" have been noticed in the headlines of not only the well known lay publications but also the popular national medical literature.

I would like to call attention to a typical case of such surgery reported by Alvarez [1]. "The woman says that some years ago, because of a mistaken roentgen diagnosis of gallstones, she had her abdomen opened. When the surgeon found that the gallbladder, stomach, and duodenum were perfectly normal, he performed a gastroenterostomy. The editor and perhaps this reader joins in wondering why the gastroenterostomy was performed." However, this question will not be discussed herein. To continue with the case, after the operation the " . . . stoma did not work at all so the abdomen had to be opened, and a jejunojejunostomy was performed. When this did not help enough, a partial gastric resection was done. Again the stoma did not work well, and again she had to have the abdomen opened. Later a jejunal ulcer formed, and again after an operation, something went wrong." The editor concludes, "Thus far the woman has had 10 operations and still she is too ill to do any work."

What were the symptoms which prompted this patient to look for medical or surgical help? Why did this patient find herself helpless and without a definite diagnosis after undergoing ten operations?

Many operations for removal of the gallbladder and appendix are being performed, often even when x-ray and laboratory reports are negative, merely because of localized pain in these regions. When the patient is not fully relieved of pain, needless surgery is again performed.

The surgeon has reached and explored the outer space of the human anatomy with success. Only a short time ago the best trained surgeon would not have dared to enter the chamber of the human heart nor tried to remove a cancerous esophagus. Today these operations have been added to the ordinary schedule of operations performed routinely in the average hospital.

One therefore wonders why so many needless operations are performed and why so many procedures yield poor results, even in patients who have definite indications for surgery proved by laboratory tests and postoperative findings [2].

To avoid the dilemma regarding poor results, the "dumping syndrome" or abdominal adhesions have been used as alibis for the unsatisfactory results. The explanation of a "syndrome" is never sought. Abdominal adhesions are caused by the distended intestine with gas pulling on the adherent viscera. This simple word can be traced often to rectal varicosities which can explain scientific etiologic factors of stomach pains simulating a surgical condition of the abdomen.

The internist or the gastroenterologist who first sees the patient with vague gastrointestinal symptoms such as belching, gas, heartburn, constipation and indigestion also shares

[1] ALVAREZ, W. On doing nothing besides abdominal exploration. *Modern Medicine*, p. 83. May 15, 1955.

[2] FRANKMAN, W. Hemorrhoids associated with nervous indigestion. *M. Rec.*, 158: 738, 1945.

the responsibility of needless surgery with the surgeons who explore the abdomen.

After all laboratory and clinical findings have ruled out colitis, ulcer, cancer or any other disease requiring surgery, a careful proctoscopic examination to rule out high seated hemorrhoids must be made. The general practitioner, the general surgeon and even the proctologist must recognize and realize that the least suspected high seated hemorrhoids cause gas (to be more exact, these hemorrhoids interfere with the elimination of gas from the gastrointestinal tract). The hemorrhoids in turn produce conditions labeled as sluggish stomach, irritable colon, spastic colon, touch of ulcer or nervous indigestion.

All of the aforementioned symptoms frequently serve as "false alarms" for needless abdominal surgery. These are the cases in which poor surgical results are obtained although the abdominal operation has been performed skillfully and under proper conditions and indicated diagnosis. Also, the internist will obtain poor results from the treatment of the patient with so-called nervous indigestion with sedatives, laxatives and vitamins. We then wonder why this patient does not get well. If the patient lives long enough, his case becomes an everlasting chronic problem to be solved by the neurologist or psychiatrist.

I would like to conclude with Osler's dictum: "The chief function of the consultant is to make a rectal examination that you have omitted [3]."

WILLIAM FRANKMAN, M.D.,
Wollaston, Massachusetts

[3] OSLER, W. Osler's Aphorisms, p. 100. New York, 1950. Henry Schuman, Inc.

The Surgical Management of Chronic Ulcerative Colitis

J. DeWitt Fox, M.D., *Detroit, Michigan*

From the Department of Surgery, Henry Ford Hospital, Detroit, Michigan.

For the past two decades surgeons have sought newer and better ways of treating chronic ulcerative colitis, the most common reason for creating an ileostomy.

The surgical treatment of ulcerative colitis has evolved from: (1) the ileostomy alone to (2) the several-stage colostomy to (3) the one-stage ileostomy and total proctocolectomy in a single operation.

In the first procedure the colon, with its inherent disorder, remained in the abdomen to serve as a foci of infection. It also favored blood loss and the danger of malignant degeneration.

The second procedure was similar to cutting a dog's tail off an inch at a time. Repeated operations were required, greatly increasing operative risk.

The third procedure can be performed on favorably selected patients today, due to the advances in anesthesia, antibiotics and after-care.

The purpose of this paper is to present the technic of surgical management which we have adopted at the Henry Ford Hospital.

Chronic ulcerative colitis is a serious infectious disease of young adulthood and is characterized by diarrhea, bleeding and passage of pus. The train of events in producing the disease are not altogether known, but stasis in the colon with constipation is frequently a precursor. Factors may be spastic colitis, gallbladder disease and appendiceal disease with reflex spasm; some observers believe that a specific organism, a streptococcus, may account for the ulcerations in the later stages. At any rate, it is a disease of emotional stress not unlike duodenal ulcer. Even as fear can produce diarrhea physiologically, so excessive mental fear in the patient with ulcerative colitis produces excessive diarrhea (often as many as ten to twenty stools in twenty-four hours).

The personality of the patient with ulcerative colitis is a factor which must be considered in both the medical and surgical management of the disease. Such a patient is tense, thin, frustrated and feels inadequate to cope with the problems of life. He may be the type of person to battle inwardly while giving a calm outward appearance.

Frequently these patients are talented, even brilliant persons who are mentally overactive and physically underactive. They are fearful and frustrated, and their ability to stand stress is gradually lowered until they wind up into a ball of tension; the colon seems to be the locus minoris resistentia and it ulcerates.

The psychiatrist would, of course, say that these patients are immature; that they have not developed a philosophy of life and cannot bear the brunt of reality without cringing from the hard knocks of life. Be that as it may, the psychologic factors in the patient's makeup and personality must be taken into account if the surgeon is to handle the patient successfully and win his cooperation, especially in the all-important postoperative period. The surgeon must realize that he is dealing with a dependent, childish, immature, emotionally unstable per-

son whose very disorder indicates his mental tension and anxiety. The tight, rigid, ulcerated colon is but a sign of a rigid, disordered mind in the patient.

For this reason, McKittrick and Moore [*20*] stress that a patient's condition must be far enough advanced and beyond medical help so that he will psychologically accept an ileostomy and can be completely convinced that it is the answer to his problem and " . . . not the end of everything . . . but the beginning of a new life slightly altered."

As Ault [*1*] has said, 15 to 20 per cent of patients with ulcerative colitis come to surgery. Properly conditioned before and after surgery, 70 to 90 per cent of these patients satisfactorily adjust to an ileostomy. Those who have the greatest difficulty are the male laborer who works outdoors and the unmarried woman who finds an ileostomy a barrier to sexual relations. However, in two of the cases presented herein, even these were not insurmountable obstacles. Cave [*6*] reports similar results.

Bacon and Trimpi [*3*] advise that before the operation the patient and family should be clearly advised as to the nature and care of an ileostomy, and a close working team should be on hand to manage the patient. This should include an internist, gastroenterologist, psychiatrist and surgeon. However, once the patient has become intractable from a medical or psychiatric standpoint, the surgeon should be placed in command of management. About 20 to 25 per cent of the patients in most clinics will come to operation because they have proved intractable to treatment and have become complicated cases having perforation, stricture, polyposis, carcinoma, hemorrhage, abscess and fistula formation or segmental ulceration.

It has been estimated that the patient with chronic ulcerative colitis has a 50 per cent chance of living twenty-five years from the time of his initial visit.

While every patient with ulcerative colitis deserves medical management for a time, with trials on bland, low residue diets, psychotherapy, antibiotics and hygienic measures to build general health, once these have failed to stop the progressive disorder in the colon, surgical intervention should be instituted early enough to produce a good end result.

In the past, efforts were made to preserve the colon, in the hope of later anastomosing the ileum to the colon after diverting the fecal stream by ileostomy for a time. However, it was found that with merely ileostomy alone the major disorder remained in the abdomen to serve as a toxic foci of infection, and to continue to keep the patient run-down, anemic and toxic.

Surgeons then became aware that the colon must also be removed. Therefore, ileostomy was first performed followed by removal of the right, then the left colon. Finally abdominoperineal resection was performed to remove the lower sigmoid and rectum. This meant that the patient had four operations, with the risk quadrupled and the attendant possibilities of postoperative complications.

While staged operations are still necessary in certain patients, the partial removal of the colon at the time of ileostomy is coming to be the more accepted treatment. Since Miller, Gardner and Ripstein [*21,25*] proposed it, the one-stage operation of partial colectomy and ileostomy is gaining acceptance as the procedure of choice, provided the patient's general condition permits. They point to a mortality rate of 4.1 per cent in seventy-two cases of primary colectomy and state that "complete one-stage colectomy is a feasible procedure." The reasons for total colectomy at the time of ileostomy are as follows: (1) It avoids toxic absorption of bacterial toxins from the right colon. (2) Hypoproteinemia can be prevented. (Protein excreted by the colon may exceed 100 to 200 gm. daily and positive nitrogen balance is difficult to maintain.) (3) Anemia and blood loss are stopped. (4) Multiple operations are not necessary. (5) Mortality is lowered. (6) It prevents the complications which follow when the colon remains after ileostomy only is performed, namely, perforation, hemorrhage, fistula, polyposis, malignant degeneration and rectal stricture.

Although surgeons would like to rid the patient with ulcerative colitis of his disorder, they frequently have only one opportunity; for once a patient has an ileostomy, he frequently will not submit to the multiple stage colectomy. Therefore, the surgeon has made a therapeutic triumph when he can perform the entire procedure in one stage. However, we do not advocate one-stage operation in all patients.

While Gardner and Miller [*15*] advocate one-stage ileostomy and subtotal colectomy to the distal sigmoid in one operation, Cattell [*5*]

prefers colectomy followed by abdominoperineal resection six months later. Few, if any, surgeons advocate leaving the colon or the rectum behind for future anastomoses.

Cattell [5] never performs anastomosis of normal ileum to any areas of the bowel which may be involved with the ulcerative process. As Miller, Ripstein and Tabah [22] point out, the danger of anastomosis with possible peritonitis may produce a 50 per cent mortality. While Ravitch [24] has described a method of preserving the rectal sphincter and making an anal ileostomy, Counsell and Goligher [9] and Bacon [2] do not leave the rectum behind because it usually ulcerates. Rankin [23] says that in 95 per cent of cases of ulcerative colitis, the rectum is the most severely diseased segment of the bowel, so it must be extirpated if good results are to follow. Removal of the rectum, of course, also avoids later strictures, abscess formation or fistula.

Aside from avoiding the dangers of infection, ulceration, perforation, hypoproteinemia and anemia, the removal of the colon is most important to prevent subsequent polyposis or malignant degeneration. Cattell [5] has noted the incidence of malignant degeneration to be 25 and 30 per cent in patients who have harbored the disease for eight or more years; Lahey [16] warns that carcinoma superimposed on chronic ulcerative colitis may mask the symptoms of carcinoma. Also, the acute inflammation of the colon hastens the spread of the tumor. Counsell and Dukes [8] report that 11.1 per cent of a series of sixty-three patients undergoing surgery for ulcerative colitis had carcinoma. Lyons and Garlock [18] found that if patients undergoing surgery had the disease more than twelve years there was a 36 per cent incidence of carcinoma.

The following indications for ileostomy and colectomy have come to be well recognized: (1) Chronic invalidism. These patients frequently lose much weight and become emaciated and semi-cadaverous. (2) Perforation. In 1 per cent of the patients in whom strictures develop, perforation follows [22]. Five per cent of the strictures are in the rectum, the most common site. Subacute and chronic ulceration and perforation are most often seen with localized abscess or fistula, especially around the rectum and anus. Local surgery is of no avail and only ileostomy and colectomy can effect a cure. (3) Hemorrhage. Massive hemorrhage, with blood loss and anemia, is best controlled by colectomy. (4) Toxicity. Fever and foci of infection clear after colectomy. (5) Arthritis and dermatitis. These indicate distant toxicity. With the appearance of joint pain, medical management must be terminated. A striking disappearance of pains follows ileostomy and colectomy [14].

Once ileostomy and total colectomy have been decided upon in the selected patient we advocate removal of the colon and rectum via the abdominal incision, as advised by Bacon and Trimpi [2], and Fallis and Barron [12]. While this may appear to be a formidable undertaking, it has been our experience that the patients tolerate the procedure amazingly well. No doubt, this is because the perineal procedure is reduced to the minimum by using the modified technic of Fallis and Barron, removing the rectum down to within 1 cm. of the anus via the abdominal incision. The perineal part of the operation consists only of removing the 1 cm. cuff of anal and rectal mucosa and submucosa.

PREOPERATIVE PREPARATION

Preoperative management is aimed at placing the patient in the optimum condition at the time of surgery and to maintain this condition during the postoperative period for rapid wound healing and to combat infection or dehydration.

The patient is reassured that surgery is the only answer to his problem and he is conditioned to what an ileostomy is like. If possible, he should meet an ileostomy patient and see how he has coped with his problem and surmounted it. The patient is given adequate sedation with phenobarbital to keep him emotionally calm.

Protein deficiencies are corrected by a high protein diet. Protein, 200 gm. daily, can be given by mouth or via tube feedings as needed. Nutritional deficiencies can be helped by whole blood transfusions and intravenous protein hydrolysates.* Among the high protein feeding formulas, we have used protinal (62 per cent protein) and meritene (30 per cent protein) with good success.

* Ideally, the patient's weight and nutrition should be restored with liquefied whole food, as advocated by Fallis and Barron. A polyethylene feeding tube and mechanical pump can be used to feed the anorexic patient continuously.

Vitamin deficiencies must be corrected. These patients frequently have a magenta red tongue and glossitis, indicating avitaminosis B complex. Therefore, B vitamins and ascorbic acid as well as vitamin K are given to maintain normal prothrombin levels and vitamin A palmitate. A high potency therapeutic vitamin formula such as theragran can be utilized to advantage.

Anemia is combated with whole blood transfusions until the hemoglobin is 14 gm. and the red blood cell count 4,500,000 or better. Liver extract may also be given intramuscularly for some time preoperatively.

Water and electrolyte balance is maintained at an optimum with the use of glucose and water or glucose and saline intravenously with the addition of potassium chloride if indicated.

Infection is controlled by antibiotics. Fever and toxicity can be lessened by giving streptomycin and penicillin. The bowel is sterilized by the administration of sulfathalidine® or terramycin® for several days preoperatively.

Laboratory studies before surgery should include a routine complete blood count and a Wassermann test, special note being taken of hemoglobin, red cell count, urinalysis, nonprotein nitrogen, fasting blood sugar, A/G ratio and total serum proteins. Because these patients frequently have liver damage secondary to absorption of toxins and bacteria from the ulcerated bowel, it is wise to include liver function studies. We prefer cephalin-cholesterol, thymol turbidity and thymol flocculation, prothrombin time and serum bilirubin. If any of these are abnormal, a bromsulphalein® test may be indicated. If persistent diarrhea is present before surgery, which might have washed out electrolytes, blood chemistries should also include sodium, potassium, chloride and CO_2 determinations.

Immediate preoperative orders include a Levin tube for postoperative suction, and a polyethylene feeding tube which is threaded down into the jejunum by means of a mercury bag attached to the end after the manner of Barron. A rectal tube and ureteral catheter are inserted the morning of surgery.

Heavy preoperative sedation is usually needed the night before surgery since these patients are excessively anxious, even though they may appear to be outwardly stoic. Sodium phenobarbital, 3 gr., is usually given and repeated as needed to insure sound rest the night before operation.

Ileostomy equipment is planned for in advance. The patient is examined carefully and a site for ileostomy is determined by placing a Torbot ring in the right lower quadrant and asking the patient to flex the thigh while in a sitting position. If this does not interfere with the ring, it is cemented in place for a trial period.

On hand for immediate postoperative use is a drainage bottle, tube and polyethylene bags [*26*]. One of these can be taken to the operating room and placed around the ileostomy to prevent any skin contamination by ileal contents.

OPERATIVE PROCEDURE

The operation of total colectomy and ileostomy is performed under spinal anesthesia when possible. The surgeon stands on the left side and makes a long left rectus pars median incision to enter the abdomen. The colon is carefully inspected to make certain no malignancy exists. The great omentum is first dissected free from the transverse colon and preserved as a natural covering for the small intestine after colectomy. The stomach with the attached great omentum is then pushed upward out of the operative field to avoid injury. The mobilization of the right colon is best accomplished by freeing up the hepatic flexure first and then working downward toward the cecum and terminal ileum, avoiding injury to the duodenum and right kidney.

If ileostomy has not been performed previously, the ileum is not sectioned until the entire colon and rectum are freed up. The left colon with its splenic flexure is then mobilized, working from the left colonic gutter. The colon is frequently shortened by fibrosis, which brings both flexures down to a lower level than normal, making mobilization easier. The sigmoid mesentery is cut in such a way as to preserve peritoneal flaps to be used later in forming a new pelvic floor.

Before operation, a ureteral catheter may be threaded into each ureter as a safeguard in later identifying the ureters with ease. However, this is not done routinely. The left ureter is identified and protected. The superior hemorrhoidal artery is sectioned and ligated at the promontory of the sacrum. The rectum and mesorectal fat are then freed from the sacrum

by blunt dissection. Here great care is taken in freeing the peritoneum from the pelvic walls to preserve as much as possible of the peritoneal flaps before it is cut.

Anteriorly the rectum is separated from the bladder and prostate in the male, and the uterus and vagina in the female. This is carried down to the superior surface of the levator ani group of muscles. The dissection in the male is more difficult since it involves incising the superior rectourethralis muscle at the tip of the prostate. A No. 15 French indwelling urethral catheter is essential for protection of the urethra. The lateral rectal stalks are identified and cut across. The middle hemorrhoidal arteries are ligated. The rectum is then cut posteriorly from the triangular iliorectococcygeus muscle to which it is still attached. With upward tension the rectum can now be straightened. (Fig. 1.) The main arteries to the colon, right colic, middle colic and left colic arteries are cut and ligated with transfixion ligatures. The colon is removed from the mesentery as close to its margin as possible in order to preserve as much peritoneum as possible. The right colon is separated from its mesentery, with care taken to protect the right ureter and duodenum.

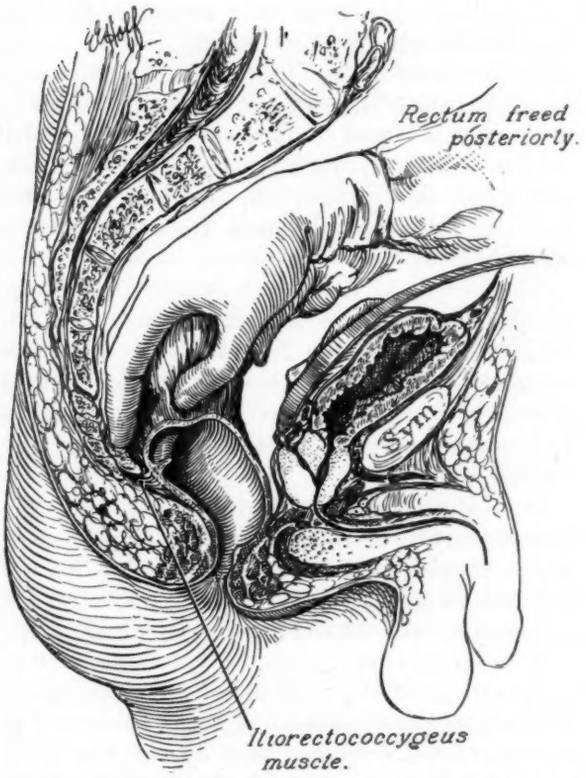

FIG. 1. Posterior mobilization is carried well beyond the coccyx. Triangular iliorectococcygeus muscle must be sectioned to free the backward curve of the rectum. (From: FALLIS, L. S. and BARRON, J. Modified technique for total colectomy in ulcerative colitis. *Arch. Surg.*, 67: 363–369, 1953.)

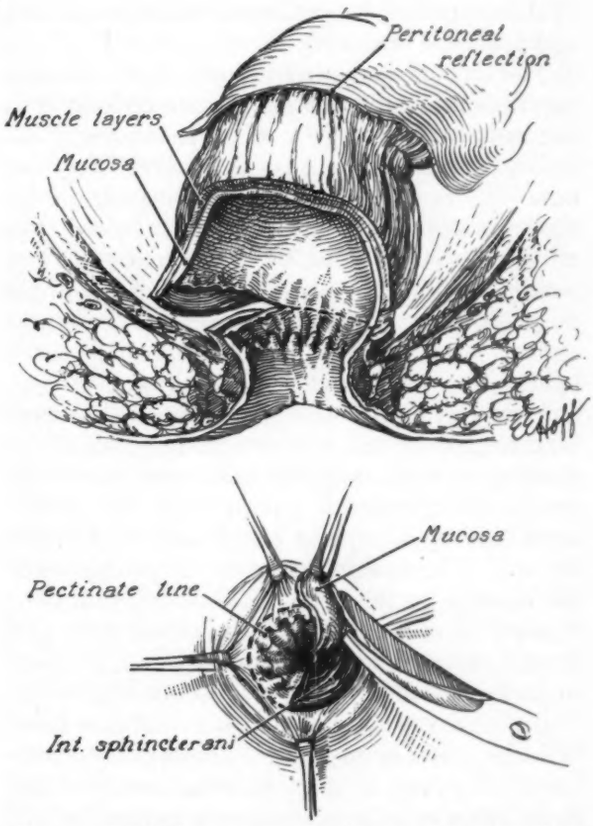

FIG. 2. With long curved scissors, the muscularis and submucosal coats of the rectum are cut close to the attachment of the levators. Increased upward traction on the completely mobilized bowel allows section of the mucosa just above the dentate line. (From: FALLIS, L. S. and BARRON, J. Modified technique for total colectomy in ulcerative colitis. *Arch. Surg.*, 67: 363–369, 1953.)

A hernia tape is tied around the rectum just above the attachment of the levators to minimize soiling. Using long, curved scissors, the muscularis and submucosal coats of the rectum are cut close to the attachment of the levators. By upward traction, the mobilized rectum can be cut just above the dentate line. (Fig. 2.) Upon removal of the entire colon, rectum and anus, the peritoneal floor is repaired. A new peritoneal floor minimizes the area of dead space beneath. After the colon and rectum have been removed, the surgeon's

attention is directed to the ileum which has been sectioned about 10 cm. above the ileocecal valve. If there is any question of involvement of the ileum with the ulcerative process, a 1 cm. segment should be examined by the pathologist under frozen section. The ileostomy must be well above the level of the ulcerative process. It should be emphasized that the entire rectum and anus are removed.

The site of ileostomy as previously marked on the abdomen is noted. In our technic it is not necessary to have a separate ileostomy incision as made by Colcock [*7*], but like Frobese [*14*], we make a circular stab wound in the abdominal wall about 2 inches below and 2 inches to the right of the umbilicus. The terminal ileum is then cut on a right angle perpendicular to the bowel, between the secondary and tertiary vascular arcades, care being taken not to devascularize the ileal stump.

A circular section of skin the size of the ileum is excised at the stab wound site. The abdominal opening is very carefully fashioned, since the success of the entire operation is dependent upon this all-important 2 inch area of abdominal wall. The opening is to the ileostomy what the heart is to the body. For normal function, it must have good circulation, free flow and be well attached to the abdominal wall, without embarrassment of lumen or vascularity.

The size and the opening is sometimes hard to judge. If it is too large, herniation or prolapse will occur. If it is too snug, stenosis and obstruction with possible fistula formation will follow. McKittrick [*18*] has found that placing the index finger alongside the ileum in the abdominal wall opening is a good criteria for obtaining the right-sized opening.

The ileum is fixed to the anterior abdominal wall by placing fine silk sutures along the free edge of its mesentery for a distance of 5 cm. and attaching it to the parietal peritoneum. Using several interrupted sutures, care must be taken not to perforate or tie any of the mesenteric vessels, as this would devascularize the ileal stump. No sutures are placed through the wall of the ileum or into its serosa for this encourages fistula formation.

While assistants elevate the patient's legs, the surgeon quickly removes the remaining 1 cm. cuff of rectal and anal mucosa and inserts a Penrose drain. The anal sphincter is preserved, which in these patients has a favorable psychic effect. They still can contract their rectal muscles and feel as though they are normal, even in the absence of a rectum.

Also, as Dennis [*10*] points out, the conservative removal of the rectum preserves sexual potency. One should not remove more than the rectal wall proper and thus avoid injury to the nervi erigentes.

This more conservative removal of the rectum favors rapid wound healing in three weeks to three months, as contrasted with the prolonged healing time of the radical abdominoperineal operation which is sometimes still closing two and three years later. It also side-steps the undesirable fistulas, abscesses and painful scars resulting from the radical operation.

The length of the stoma is also important. If too short, it will retract beneath the abdominal skin level. If too long, it is prone to edema and postoperative obstruction. About 2 inches is correct. This will contract down later and "mature" to about a 1 or ¾ inch ileostomy.

Once the ileostomy has been fashioned, the opening found to admit the index finger freely beside the ileum and the mesentery delicately sutured to the parietal peritoneum, the left paramedian abdominal incision is closed.

A collar of three layers of vaseline gauze is wrapped around the ileostomy and clipped. The edges of the gauze are sutured to the distal mucosa of the ileostomy and to the skin. This forms a tent to prevent leakage of ileal drainage at the skin level. The gauze is slit after twenty-four hours. Edema around the opening has by this time sealed it off at the skin level.

Suggestions on Technic

Some of the most helpful details of this operation are as follows:

1. Preoperative placement of ureteral catheters for identification in selected patients.
2. Conservative and delicate dissection of the rectum to preserve the nervi erigentes and the sexual potency of the patient.
3. Careful fashioning of the ileostomy opening, taking ample time. The success of this major procedure rests on the all-important 2 inch area of the ileostomy.
4. Using the index finger as a guide to the size of the opening will help prevent making it too large or too small. It should be made large enough to admit the finger beside the ileum freely.

5. The opening in all layers of the abdominal wall should be made on a vertical plane. The opening in the peritoneum should be the same diameter as the opening through the obliquus internus and externus, Scarpa's fascia and skin. If any one of these layers is tight, it will cause stenosis or obstruction and impair the function of the ileostomy.

6. A No. 15 French catheter should be kept in the urethra during the dissection around the superior rectourethralis muscle and the prostate.

7. Ileostomy care should begin in the operating room. The skin should be protected by the vaseline gauze around the ileostomy and the application of the polyethylene bag. This prevents any contamination of the abdominal incision or the stab wound.

8. We leave the sutures in place ten to fourteen days, at which time the patient should be wearing a Torbot, Rutzen or Royal ileostomy bag.

9. Gentle handling of the bowel is necessary since the friable wall with its pathologic ulcerations will perforate very easily.

10. Gentle pelvic dissection is also important to prevent postoperative traumatic phlebothrombosis of the pelvic veins which occurred non-fatally in one of our patients.

POSTOPERATIVE CARE

The care of the ileostomy patient is one of the most extensive exercises in postoperative management that surgery offers, for all the complications of abdominal surgery must be combated plus the problems common to the ileostomy. Added to this are the psychic problems of a thin, nervous and often uncooperative, emotionally unstable patient. Therefore, every surgeon should anticipate the complications and prevent them whenever possible. The thin patient with ulcerative colitis and a small body mass tolerates ileostomy obstruction or fluid and electrolyte loss very poorly.

Blood loss should be replaced in the operating room, immediately after the operation. The determinations of hemoglobin, red blood cells and serum protein levels should be made the morning after surgery.

Hypoproteinemia can be elevated by adequate oral feedings; intravenous protein hydrolysates and small transfusions of whole blood will supplement oral protein deficiency.

Nutrition is paramount. As soon as the patient can tolerate it, a high protein diet is given with formulas fortified with protein hydrolysates, dextri-maltose and vitamins. However, it must be remembered that these patients are thin and small. Their gastric capacity has been reduced, and many overzealous surgical residents have overloaded a patient postoperatively, only to have him vomit and lose fluids and electrolytes. Therefore, the patient should set his own pace on oral feedings. If tube feedings are used, they should be given in small amounts. Vomiting or diarrhea through the ileostomy are both to be avoided because of the electrolyte loss.

Infection can be prevented by antibiotics such as streptomycin in combination with penicillin. The wound incision, the rectal drainage and the peri-ileostomy area of the abdominal skin should be watched carefully for infection.

Intravenous fluids sufficient to replace insensible perspiration and adequate urinary output must be maintained. Nearly 25 per cent of all patients will experience partial obstruction at the ileostomy or discharge tremendous amounts of ileostomy fluids. The ileostomy drainage may contain as much as 7 gm. of sodium chloride for each 1,000 cc. This must be replaced orally or intravenously. Of course, each liter of normal saline replaces 9 gm. of sodium chloride to the body stores.

Obstruction is usually followed by loss of appetite, nausea and vomiting, dehydration, hypochloremia and alkalosis.

Diarrhea causes acidosis with a lowering of serum sodium and potassium. A careful record of serum blood levels of electrolytes, especially potassium, sodium, chloride and CO_2, should be made and appropriate replacement made.

Hyponatremia is corrected by giving normal saline with or without glucose.

Hypokalemia can be combated with potassium chloride which comes in 1.49 or 3 gm. ampoules, or 1.14 per cent solution. A dynamic ileus may follow a low serum potassium, and quick potassium replacement will cause normal peristalsis to return.

If diarrhea should ensue, a tremendous amount of fluid can be lost in just a few hours. Therefore, one should try to keep ahead of fluid loss by giving massive amounts of intravenous fluids. We had to give as much as 8,000 cc. of fluids to a patient in one twenty-four-hour period.

The patient should be placed on a bland,

low residue, high protein diet. It should not contain any irritating foods such as acid fruit juices or spices which might make the ileostomy run rapidly, but should be a bit constipating. Appetite control is a problem, since many of these patients have a poor appetite postoperatively and refuse to eat. We have found that testosterone, 25 mg. three times a week, is a good appetite stimulus, and for mental well-being and increasing appetite the euphoria-producing action of cortisone is helpful. Doses of 25 mg. daily for a few days will spark appetite without impairing wound healing. If the surgeon can build up the patient's confidence in his care and make it profitable for him to eat, he will usually cooperate.

The advantage in using the polyethylene bag is that the ileostomy can be examined through the bag without its removal. The frequent examination of the stoma, as stressed by Lahey [17], is important if gangrene, leakage and peritonitis are to be avoided. If the ileostomy becomes non-visible, it can be revised before gangrene, leakage and peritonitis occur.

Should the skin become irritated, karaya gum powder* can be used in place of the usual cement to apply the polyethylene or Rutzen bag. Turnbull [26] discovered that this powder is unique in that it can be applied to a weeping skin surface and will protect the skin, while at the same time providing a sticky surface on which to apply the bag.

Tincture of benzoin, aluminum paste and silicone paste are also used as skin protectives, but nothing is as good as mechanical removal of the ileal secretions before they have had a chance to do damage.

ILEOSTOMY DRAINAGE

One of several methods of ileostomy drainage may now be used. The conventional method of suturing a catheter into the ileostomy opening as advocated by Dennis [10], Colcock [7] and others has been effective in their hands. Frobese [14] no longer inserts a catheter into the lumen of the ileum since he observed a catheter erode through the bowel and cause a fistula at the level of the parietal peritoneum. He now uses a 1 inch Penrose drain which is 3 feet long and may be sutured to the rim of the ileostomy. More recently, Turnbull [26] has been using a polyethylene bag around the ileostomy with no tube in the stoma. This, if correctly applied in the operating room, is the best method we have seen.

These polyethylene bags* are placed right over the stoma at the time of surgery. Attached to the skin, they prevent any contamination. This avoids any skin irritation which sometimes follows the catheter or Penrose drain method. These usually leak after forty-eight hours and the catheter lumen is often too small to carry away the thick small bowel contents, and blockage occurs. Unless the skin is kept scrupulously clean it soon becomes irritated by the ileal contents. Needless to say, this method of Turnbull's is a boon to the nursing care of these patients and is a great advance in ileostomy management.

Methods

One of the problems which has plagued the surgeon and received continued study for an ideal solution is the technic of drainage of an ileostomy in the immediate postoperative period.

The aim, of course, is to divert the irritating small intestinal enzymes and ileal contents into some drainage device which prevents leakage onto the skin. Many of the complications of ileostomy are attributable to skin contamination, with the attendant irritation, inflammation, infection and even abscess formation around the ileostomy.

The various methods which have been used to divert the drainage, to promote decompression and protect the skin during the postoperative period will be presented, and a new ileostomy device (the Royal ileostomy appliance) is described which requires no cement, can be rapidly applied and is seal-tight against leakage.

Soft Rubber Catheter. The oldest and most universally used method of ileostomy drainage is the soft rubber catheter (Fig. 3) which is inserted at the time of surgery and held in place by a few sutures. Another method is to place long, loose sutures to the skin margin, avoiding the wall of the ileum and then taking one or two sutures at the lips of the ileum as well to hold the catheter in place.

The catheter, usually a No. 26 French or larger, should be of soft pliable rubber to avoid

* Manufactured by the John F. Greer Co., Oakland, California.

* Designed by Dr. W. E. Furr, Jr., and carried by the Marlen Manufacturing and Development Co., Cleveland, Ohio.

any undue pressure on the wall of the ileum and the danger of perforation. Adequately large holes should be cut in the sides to facilitate drainage.

Dennis, Lahey, Colcock and others have used this method. However, in three or four days the sutures will tear out, after which the catheter cannot be kept in place unless new sutures are placed in it. Therefore, of necessity, this method of postoperative drainage is temporary and short-lived.

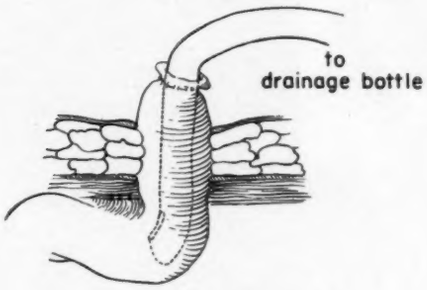

FIG. 3. Soft catheter.

FIG. 4. Penrose drain.

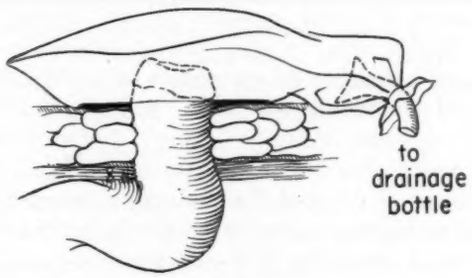

FIG. 5. Polyethylene bag.

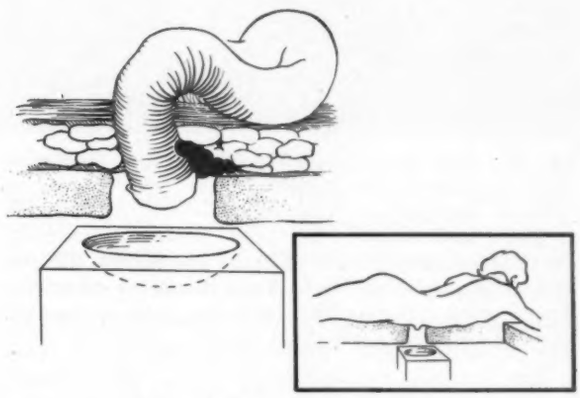

FIG. 6. Dependent drainage.

Afterward, when the catheter has pulled out, the surgeon must protect the patient's skin with aluminum paste or other skin protectives, and use cotton pads around the ileostomy until such time as a permanent bag of the Koenig-Rutzen type can be applied, usually on the fifth day. This type of permanent drainage can be facilitated much better if the ileostomy has been brought out through a stab wound, rather than through the original wound incision.

Penrose Drain. Frobese has recommended using a Penrose drain (Fig. 4), 1 inch in diameter and 3 feet in length, sutured to the open end of the ileum. The bowel is invaginated slightly into the tube to prevent leakage. This carries drainage for two or three days. This drain has the advantage of being lighter in weight than the soft rubber catheter and puts no tension on the bowel. Its disadvantage is its temporary usefulness.

Warren and McKittrick [*28*] use a slight variation of this by placing a right-angle glass tube in that part of the ileum external to the abdominal wall. They purse-string the ileal margins to the glass tube and attach a Penrose drain to the opposite end. This, too, is used for the first four or five days.

Polyethylene Bag. Turnbull has introduced a unique method of protecting the skin without suturing the ileostomy margins to a drain. He places a plastic bag around the ileostomy at the time of surgery. (Fig. 5.) This bag has a diaphragm which may be cut to fit the ileostomy and then attached to the skin with cement. At the drainage end of the bag a large mushroom catheter may be tied in place. This device has the advantage of being transparent, and the viability of the ileostomy can be observed at all times, as well as the character of the drainage. The bag will remain in place for about seventy-two hours. It can be readily replaced and the skin still protected against contamination.

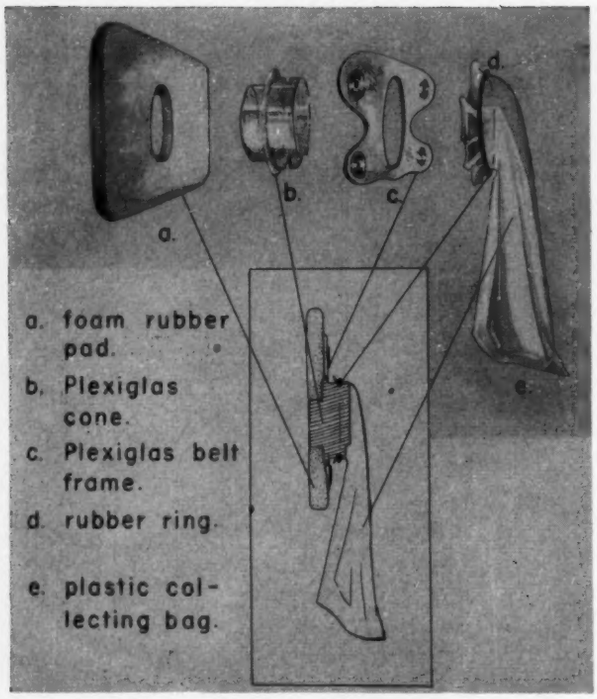

FIG. 7. The Royal ileostomy-colostomy appliance. This new device for collecting the fecal stream in cases of ileostomy and colostomy is held comfortably in place by a snap-on belt and requires no cement. Parts are shown in the order of assembling. (From: FOX, J. D. and BRUSH, B. E. A new ileostomy-colostomy device using a disposable plastic bag and no cement. *J. A. M. A.*, 156: 1398–1399, 1954.)

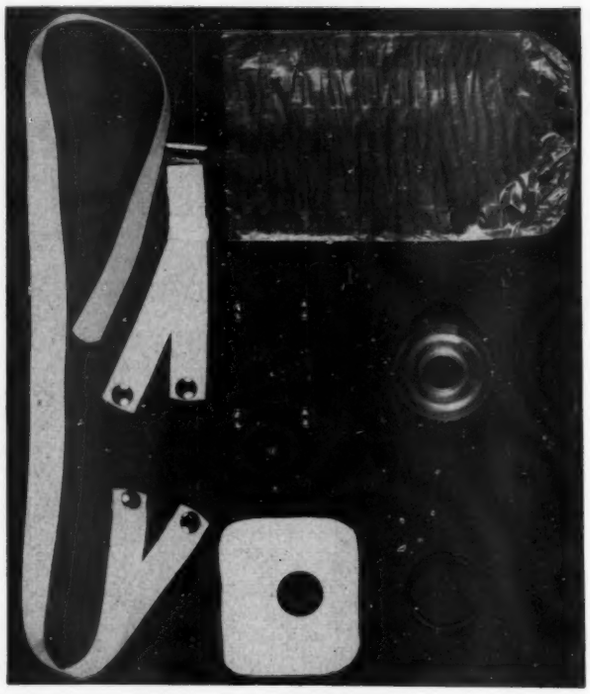

FIG. 8. Appliance disassembled showing simplicity of parts. (From: FOX, J. D. and BRUSH, B. E. A new ileostomy-colostomy device using a disposable plastic bag and no cement. *J. A. M. A.*, 156: 1398–1399, 1954.)

Dependent Drainage. While all of these methods are useful, they cannot be utilized once severe skin irritation has occurred.

When the skin has become too raw and irritated to accept a cement-type ileostomy bag, some other method must be used to divert the ileal contents. Once skin breakdown has occurred, the patient should be placed on a Foster frame and dependent drainage instituted. (Fig. 6.) In a matter of a few days to a week or so, the skin will heal. Once more a cement-type bag may be applied, or ileostomy revision made. In the meantime, the skin should be kept dry, meticulously clean and exposed to a bedside lamp for a half-hour several times a day.

Dependent drainage is the one sure way to collect ileal contents without skin contact. While a last resort, it is nonetheless many times a valuable expedient.

Permanent Drainage. The Koenig-Rutzen bag, which has revolutionized the life of the ileostomy patient, has one disadvantage, that of requiring cement for its application. Some patients become allergic to the rubber or the cement. A new type of ileostomy appliance, not requiring cement, is illustrated in Figures 7 to 9. It has the advantage of using a plastic bag which can be quickly discarded and replaced. It is light in weight and not bulky. Its foam rubber pad is non-irritating to the skin, yet seals tightly to minimize leakage. The entire appliance is washable and can be applied in seconds, requiring no waiting period for cement to dry. It avoids the danger of allergic skin reactions.

While surgical technics in performing ileostomy and colostomy have advanced in recent years, little change has been made in the design of devices for the postoperative comfort of the patients undergoing these operations.

Ideally, there are several features which any device should have for collecting the fecal stream from an ileostomy or colostomy. These are: (1) The device should be easily applied. (2) It should be light in weight. (3) It should not be bulky enough to distort the body contour or bulge through the clothing. (4) It should be odorless. (5) It should have no irritating

properties to macerate or irritate the skin of the abdomen around the ileostomy or colostomy. (6) It should be easy to empty or dispose of.

Because these criteria have been only partially met by the popular rubber-type commercial ileostomy and colostomy bags, a continuing search has been made to develop an ideal device. This modification for it was developed after a patient suffered extreme skin irritation and ulceration around an ileostomy because of sensitivity to rubber cement which had to be applied to keep the ileostomy bag in place.

To circumvent this problem, it was believed that something had to be developed which would not require rubber cement, yet would prevent leakage of the ileal contents onto the skin.

To avoid any allergenic factor which might be present in a rubber bag, attention was directed to plastic as an ideal material. However, something had to be developed to seal the plastic device around the ileostomy to prevent leakage. For this a foam rubber pad was found to be not only non-irritating but also clean, absorbent, easily washed and a soft cushion which would fit any body contour without undue pressure. Best of all, it provided a perfect seal against leakage.

Finally, a plexiglas cone was developed with an incomplete rim which directed the ileostomy drainage downward into the bag of odorless, disposable, plastic material held in place very simply by a rubber compression ring.

The entire apparatus, which consisted now of a foam rubber pad, plexiglas cone, plexiglas belt frame, plastic collecting bag and rubber ring, were held in place by a waistbelt which kept the device comfortably snug and airtight.

Simple as the device may seem, it works remarkably well, and can be quickly slipped on and off by the patient. There is the advantage that no rubber cement is necessary, yet the first patient to use it now wears it for an entire day without leakage. Although she has an allergic tendency and very sensitive skin, she has had no skin irritation since first wearing the device one year ago.

Technic of use: The skin is washed and dried around the ileostomy. A little talcum is applied to make the skin smoother, serve as an absorbent of perspiration and give a pleasant odor.

The foam rubber pad, with plexiglas cone and plexiglas frame is then applied, the belt

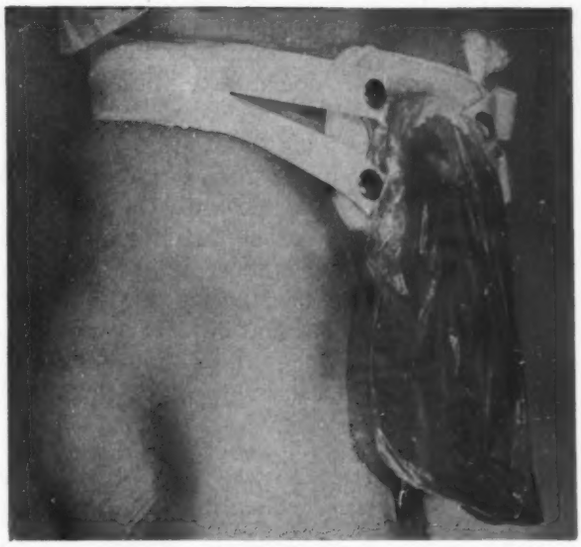

FIG. 9. Appliance in position, held comfortably with snap-on belt and requiring no cement. (From: FOX, J. D. and BRUSH, B. E. A new ileostomy-colostomy device using a disposable plastic bag and no cement. *J. A. M. A.*, 156: 1398–1399, 1954.)

snapped on the frame, a plastic bag placed over the cone and a rubber compression ring applied over the rim to hold the bag in place. This is accomplished in one minute or less, in contrast to the rather messy and prolonged procedure needed with rubber adhesives. Since this is an almost air-tight arrangement, the chance for odor escaping is reduced to a minimum.

To empty the bag, the rubber ring is stretched to allow the bag to slip from the rim of the plexiglas cone. The bag with its contents is discarded. A new, odorless, transparent plastic bag is then applied, all without finger contamination and in a matter of seconds. An added advantage is that the patient can observe the color and character of the ileal contents very quickly through the transparent bag.

Patient acceptance: While many patients dislike changing a routine to which they have become accustomed, we have found that patients who have switched from the rubber-type bags to this plastic bag are well pleased. They report that it is more convenient, lighter in weight, less bulky, odorless and has the added advantage of being able to be quickly disposable.

The bag is equally adaptable to a colostomy. However, its greatest value will be appreciated by the ileostomy patient who has the constant threat of skin sensitivity due to rubber cement.

Because the device is made to a patient's individual measure, it can be made to fit any size ileostomy or colostomy. The smallest ileostomy to which it has been applied was that of an eighteen month old infant.

Surgeons and nurses alike appreciate the advantage of having an ileostomy device which can be applied early in the postoperative period. Having an ileostomy bag which can be used as early as four days postoperatively hastens the early ambulation of the patient, as well as serving as a tremendous morale factor in that the patient can resume a normal life immediately.

The fact that the bag can be applied a few days postoperatively, or almost immediately if the ileostomy begins working, is a boon to the nursing care of these patients. Nurses can be readily taught to remove the disposable bag with its contents without skin contamination. This is far preferable and cheaper than cotton abdominal pads which have to be used in great quantity.

Another advantage to the Royal ileostomy appliance is that it requires no cement which might serve as a wound contaminant or serve as a nidus for infection if applied directly over the wound. It seals against leakage, and effectively directs the fecal stream into the bag.

The Royal ileostomy appliance has met with complete patient acceptance and has been successfully used on patients ranging in age from eighteen months to eighty-five years.

ILEOSTOMY AFTER-CARE

The success of any operation for chronic ulcerative colitis depends not only on good operative judgment and technic but also on an awareness of the surgeon of postoperative problems which may arise.

Few ileostomies function perfectly at first. When one considers that the artificial creation of a fecal fistula has been made, and a naked segment of small bowel has been suddenly traumatized and is now open to infection, one can readily realize how prone it is to edema and temporary obstruction.

The physiologic train of events in the maturation of an ileostomy are these: (1) immediate edema; (2) appearance of fibrinopurulent exudate; and progression of (3) induration and serosal peritonitis until rigidity is maximum on about the tenth day. Peristalsis may be seen for the first few days in the ileostomy, but this soon disappears. With increased rigidity of the stoma and no peristalsis, a functional obstruction exists. Actually, the patient has an intestinal obstruction with increased peristalsis above the ileostomy and subsequent cramps. The thick yellow-green ileostomy fluid becomes thin, watery and brown, and the stoma discharges excessively. A colon type odor appears; culture will show that the normal flora of the ileum has shifted to that of the colon in number and type. Gradually, the inflammatory changes and obstructive symptoms subside. The ileostomy works normally again.

It must also be remembered that the serosal surface of the ileostomy must be covered eventually by mucosa, and eversion of the mucosal lining must take place until it reaches the skin level. This pouting of mucosa can also cause obstruction. The longer the ileostomy, the more prone it will be to obstruction in the postoperative period.

Turnbull and Crile [*27*] hasten this eversion by trimming the ileostomy in such a way as to make the mucosa long enough to evert part of the way down the ileostomy. Dragstedt [*11*] has attempted to prevent this physiologic eversion by placing a skin graft around the ileostomy, but this only causes stenosis and later has to be slit or removed.

Ileostomy after-care by the patient himself should be taught as early as possible. The patient should be shown how to apply the cement around the ileostomy and how to attach the bag; he should ambulate as early postoperatively as possible. This will do more for the patient's morale than anything else, for if he can be up and about early after operation he feels that he is on the way to recovery.

The patient should be taught to insert his little finger, well lubricated, into the ileostomy about once a day to keep it dilated and prevent contraction and stenosis.

Should the ileostomy run too much, a small amount of paregoric will help to slow it. If it fails to function, a small soft rubber catheter may be inserted and the ileostomy irrigated with saline or warm cottonseed oil.

After the patient has graduated through the three sizes of ileostomy rings and the stoma has contracted to its permanent size, he should be fitted with a permanent ileostomy bag, either

Torbot,* Rutzen† or the newer Royal ileostomy bag,‡ which requires no cement.

Once the patient is discharged from the hospital, he is not discharged from the surgeon's care. He should be followed up for the remainder of his life and the ileostomy inspected periodically to insure its normal function.

Late obstruction of an ileostomy is not a rarity. In one patient in whom we left the stoma a little long, it perforated at about the 1 inch level and began discharging through the fistula, which led us to believe that nature physiologically likes a 1 inch level ileostomy; if the surgeon fails to fashion it, nature will. The patient is doing fine, and we hesitated to revise the ileostomy. He is now using nature's revision.

ILEOSTOMY DYSFUNCTION

Ileostomy Obstruction. This is a frequent occurrence in the immediate postoperative period and is caused by two factors: (1) immediate edema around the stoma and (2) peritoneal reaction. The edema may subside in a few days, but the ileostomy still fail to function due to a so-called functional obstruction secondary to peritonitis of the serosal surface distal to the skin. (Fig. 10.)

To avoid the dysfunction, minimum handling of the ileostomy is desirable. Turnbull [*26*] has pointed out that every ileostomy must go through a maturation period in which the mucosa everts until it meets the abdominal skin at its base. As eversion takes place, edema and peritonitis subside. A long ileostomy will mature slowly, and a short one more rapidly. Therefore, a short ileostomy is less prone to obstruction in the postoperative period.

To hasten this maturation process, Turnbull and Crile [*27*] advise trimming the stoma, removing a cuff of muscularis, and allowing the mucosa to evert part of the way down on the sides of the ileostomy. This provides a physiologic dressing to the naked segment of ileum, preventing peritonitis and therefore dysfunction.

During the immediate postoperative stage of edema, a catheter may be inserted, but it should not be large enough to cause any decrease in the vascularity or blood supply to the ileostomy. The fragility of an ileostomy cannot be overemphasized since fistula formation can occur readily if any undue pressure is applied to the ileal wall.

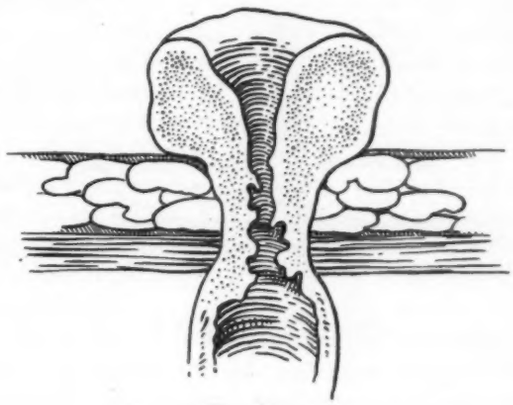

FIG. 10. Immediate edema.

The catheter may be left in place, if it is of the Foley type, with a small rubber bag which can be inflated with just enough water to keep it in place. Through this, small saline irrigations will favor a return of ileostomy function and the expelling of gas; the watery, brown, foul stool usually is replaced shortly by the more solid, thick, yellow-green contents.

Signs of ileostomy obstruction which most frequently occur about the tenth postoperative day are a watery, brown, foul ileal discharge, fleeting abdominal cramps with a loss of appetite, and visible peristalsis through the abdominal wall. Vomiting, dehydration and acidosis will follow, with a rise in non-protein nitrogen and depletion of chlorides, sodium and potassium in the blood; also, extreme weight loss due to fluid depletion will occur.

If steps are not taken quickly to relieve the obstruction, correct the fluid imbalance and replace electrolytes, the patient will go on to shock and death.

As soon as the patient complains of intestinal cramps, an ileostomy decompression type of catheter should be passed to allow drainage. Intravenous fluids should be given with the replacement of sodium chloride and potassium as indicated by blood chemistry determinations. Should shock ensue, whole blood should be administered.

Narrowing of Distal Ileostomy. Distal fibrosis and secondary narrowing of an ileostomy

* Manufactured by Eastern Sales Company, West Hartford, Connecticut.

† Manufactured by H. R. Rutzen Co., Chicago, Illinois.

‡ Manufactured by Royal Surgical Appliance Co., Royal Oak, Michigan.

will cause obstruction after the immediate postoperative period. The cause of this physiologic contraction is simply a stoma that is too long, and the peritoneal reaction, with ultimate fibrosis, narrows the lumen until dysfunction occurs. (Fig. 11.)

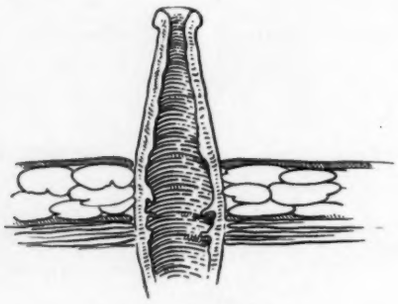

FIG. 11. Distal fibrosis.

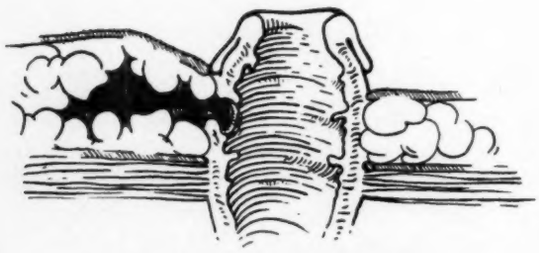

FIG. 13. Subcutaneous fistula.

To prevent this narrowing, a short, 1 inch stoma with good mucosa everted all around should be made.

Daily dilatation of the longer ileostomy should be made by inserting the well lubricated index finger into the stoma each time the ileostomy bag is changed. This will help avoid contraction and narrowing of the lumen. This procedure is advised in all ileostomies at regular intervals of three or four days.

Skin-level Fistula. Fistula formation in the ileostomy (Fig. 12) has plagued surgeons in a certain percentage of cases. Warren and McKittrick [*28*] report that in about 7.1 per cent of their series of 210 patients ileostomy fistulas developed. These may be caused by pressure from a skin opening which is too small, or from intralumenal pressure from a hard rubber catheter or glass tube left from drainage. Too rough handling of the ileostomy in its preparation may injure the blood supply, favoring a fistula; a suture between fascia or skin into the wall of the ileum may also produce a fistula, so should be avoided. Finally, the use of dry gauze around the base of an ileostomy is to be discouraged since its removal later may produce a perforation.

Prevention consists of delicate ileostomy preparation, especially of the skin opening, which should be fashioned just large enough to

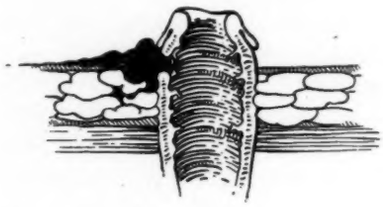

FIG. 12. Skin-level fistula and ulceration.

allow the ileostomy to exit, and allow the insertion of the surgeon's index finger. No hard rubber catheters should be used, and nothing should be inserted into the lumen which is large enough to embarrass the blood supply.

Lahey [*17*] emphasizes that fistulas will not close spontaneously. Suturing them seems to be of little value, although this may be tried. Since a 1 inch ileostomy seems to be nature's choice, a fistula will frequently form at this level above the skin. If this occurs, the distal lumen should be connected with the fistula by an incision. This may not be the ideal-appearing ileostomy, but if it functions well no further surgery need be performed.

However, the skin-level fistula favors wound contamination, skin irritation and abscess formation. Therefore, a major ileostomy revision is usually required.

Subcutaneous Fistula. An abdominal wall fistula, whether at the skin level, subcutaneous or fascial layers, is frequently the aftermath of a hastily fashioned ileostomy opening. (Fig. 13.) The success of the entire procedure depends on the vital 2-inch area of the ileostomy.

These fistulas are usually caused by too small a skin and fascial opening in the abdominal wall, followed by contraction, stenosis and obstruction of the blood supply or lumen of the ileostomy; either of these favors fistula formation.

To prevent a subcutaneous fistula, the opening in the abdominal wall for the ileostomy should be vertically flush and of the same caliber through all the layers of the abdominal wall and skin. If any layer, fascial, muscle or

skin, is smaller than the others, it is apt to constrict and embarrass the lumen and blood supply. The gloved index finger should be placed between the bowel and skin and muscle layers when fashioning the ileostomy to give ample room for the flow of ileal contents. Sutures should not be placed in the wall of the ileum, as these may favor fistula formation. However, anchor suture of the mesentery to the parietal peritoneum may be used safely.

The patient should be instructed to place the lubricated index finger through the opening frequently to prevent contraction and keep all the layers dilated.

If obstruction and dysfunction occur, catheter insertion with saline irrigations may give relief. However, a catheter should not be left in place in this instance as it will cause pressure necrosis at the point of constriction.

If dysfunction does not clear in two or three days and the patient's condition seems poor, early revision is indicated before fistula formation or ulcerative ileitis occurs in the dilated loop, proximal to the abdominal wall.

Wound Abscess. Peri-ileostomy wound infection and abscess is a major complication. This may occur after fistula formation, or result from a leak of the ileal contents down the side of the ileostomy into the wound. A suture in the wall of the ileum may allow escape of ileal contents into the abdominal wall.

Prevention consists of avoiding factors which favor fistula formation.

To make certain that the ileal contents cannot escape down into the wound, a layer of vaseline gauze should be sutured from the lips of the mucosa down to the skin around the ileostomy base. This will serve as a tent to protect the wound against ileal leakage. Catheter drainage of the ileostomy and the early application of an ileostomy bag which allows the patient to ambulate and favors drainage of the ileal contents into a bag, rather than onto the abdominal skin, will do much to side-step this complication.

The supportive treatment is a high protein diet with antibiotics, blood, fluids and vitamins. Adequate drainage must be established and an energetic conservative program instituted with revision kept in reserve if improvement does not result.

Skin Irritation. Skin reaction to contact with the ileal contents can be violent. The cause of the skin irritation is obviously contact dermatitis due to a leak of ileal contents onto the skin. This may be due to a poorly fashioned stoma with contraction along one side and poor drainage into the ileostomy bag, or a sensitivity to the rubber cement or rubber bag.

To prevent irritation, care in fashioning the ileostomy to insure an erect right-angle stoma for good drainage is important. Skin protection with aluminum paste will help should drainage methods fail to carry away the ileal contents.

A good-fitting ileostomy bag used early or a plastic bag which never lets the ileal contents touch the skin is the best way to avoid this problem. A new Royal ileostomy bag requires no cement, can be used early and avoids any allergic reaction of the skin to cement, rubber or leakage.

However, nothing can replace good skin care with frequent mechanical cleansing in those patients in whom drainage methods have broken down. The skin should be coated with aluminum or silicone paste if no device can be fitted for drainage.

Karaya gum powder, when applied to the skin, will allow the application of a rubber cement over a raw and irritated skin surface, while allowing healing to take place from underneath.

Keeping the skin dry, with frequent exposure to a bedside lamp, will favor healing.

General supportive therapy such as a vitamin-high protein diet with supplemental ascorbic acid and protection against infection by antibiotics are also indicated.

Prolapse or Herniation. Prolapse of the ileostomy is usually due to a failure to place some type of anchor suture between the mesentery and the parietal peritoneum. (Fig. 14.) While sutures placed between the ileal wall and the peritoneum are discouraged, the mesentery may be used safely for this purpose.

Herniation of a loop of ileum beside the ileostomy is caused by too large an opening in the abdominal wall, thus leaving room for a hernia to occur. This can be avoided by making the opening just large enough for the ileum plus the index finger. A bulky opening in the abdominal wall is avoided by cutting the mesentery at right angles between the secondary and tertiary arcades, thus preventing the necessity of drawing a bulky mesentery through the abdominal wall where it may later contract, leaving room for a hernia to form.

If the prolapse is not marked, it is best left

alone. If it later adheres to the abdominal wall it can be trimmed back to the ideal 1 inch level.

In herniation of the bowel a reduction must be made if obstruction occurs. A revision of the ileostomy with a smaller opening in the abdominal wall is made, preferably at a new site

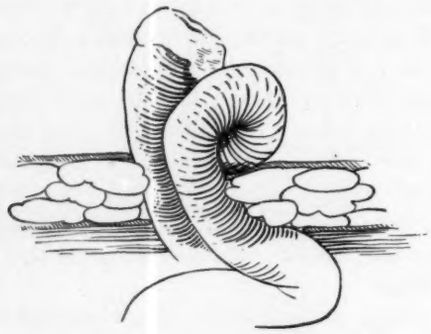

FIG. 14. Prolapse and herniation.

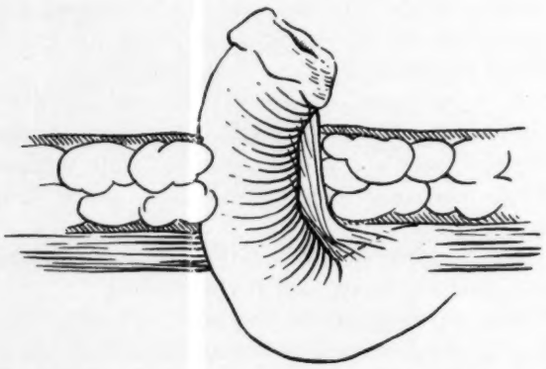

FIG. 16. Mesentery retraction and distortion of stoma.

in the abdominal wall. The index finger is placed beside the bowel when making the opening, and closure is performed without tension.

Volvulus. Volvulus of the ileum may occur, especially if a lateral shelf of peritoneum along the lateral abdominal wall is not made to avoid any hiatus through which the bowel may slip. (Fig. 15.)

This may require immediate laparotomy if acute obstruction supervenes, since this can be a grave emergency.

Mesentery Retraction. A poorly draining ileostomy which leaks on the skin may be due to mesentery contraction, drawing one side of the ileostomy downward toward the skin. (Fig. 16.) The prime cause of this is drawing too much mesentery into the abdominal opening, with its later contraction pulling the ileostomy downward. This causes difficulty in directing the stoma into a drainage bag and results in leakage between the bag and the skin.

Prevention consists of careful ileostomy preparation, cutting the mesentery at right angles just proximal to the tertiary vascular arcade. (Fig. 17.) This gives an erect ileostomy,

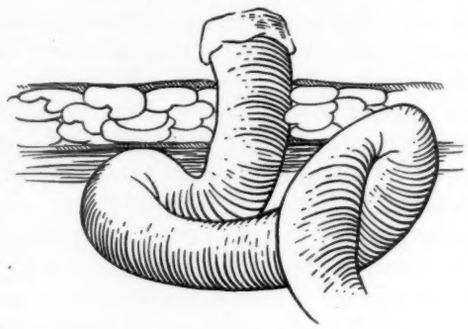

FIG. 15. Volvulus.

FIG. 17. Ileostomy preparation. The mesentery is cut at right angles between the secondary and tertiary vascular arcades. The elimination of excess mesentery makes a cleaner stoma and prevents retraction later.

without a bulk mesentery, avoids the danger of too large an opening and subsequent herniation, or too much mesentery which may later retract, tilting the ileostomy into an unfavorable position. The erect ileostomy makes for ideal fitting of a collection bag.

Should retraction occur, a plastic procedure should be performed, freeing the skin and mesentery to bring the ileostomy into an upright position. Care must be taken to insure a good blood supply to the distal ileum above the

skin level. A custom-fitted ileostomy bag may be required, and if drainage is still impossible, a major revision may be required later. (Fig. 18.)

Phlebothrombosis. Phlebothrombosis with subsequent pulmonary embolism is one of the major complications of abdominal surgery, especially that which involves the pelvic areas. Trauma to the pelvic veins, together with the altered fluid balance changes in the postoperative period, may predispose these patients to phlebothrombosis.

Prevention consists of adequate hydration postoperatively and early ambulation. Alertness to the temperature and pulse curve, plus daily palpation of the patient's legs, will help pick up this complication at the earliest moment.

Anticoagulant therapy, using intravenous heparin, is begun at the earliest indication of phlebothrombosis. The legs are wrapped with elastic bandages to avoid venous stasis. If bilateral or deep leg involvement is present, without response to heparin in a forty-eight-hour period, superficial femoral ligation should be considered. Any chest pain, with or without hemoptysis, following leg pain, should suggest pulmonary infarction and a chest roentgenogram will help confirm the diagnosis.

Active motion of the patient in bed, plus deep inspirations, and early ambulation are important preventive measures.

ILEOSTOMY CLUBS

The psychologic jolt which most patients suffer at the thought of a constantly discharging intestinal stoma is cushioned if the patient realizes that others have successfully carried on a normal life after ileostomy. It is not so much a matter of "misery loves company," but rather the acceptance of a handicap which will not, in the long run, deprive him of the joys of living.

To accomplish this psychologic adjustment and hasten a patient's rehabilitation, Dr. Albert S. Lyons and his associates of the Mount Sinai Hospital have organized an ileostomy club, where members can meet, listen to medical speakers and help other patients bolster their morale.

It is urged that ileostomy patients meet and discuss mutual problems with other patients who have successfully adjusted to an ileostomy. By so doing, management problems will be lessened.

One of McKittrick's [20] patients, a university professor who adjusted well to his ileostomy wrote: "I have lived with my ileostomy for 14 years already and have had a full and active life. . . . I have traveled everywhere with my ileostomy. . . . It has enabled

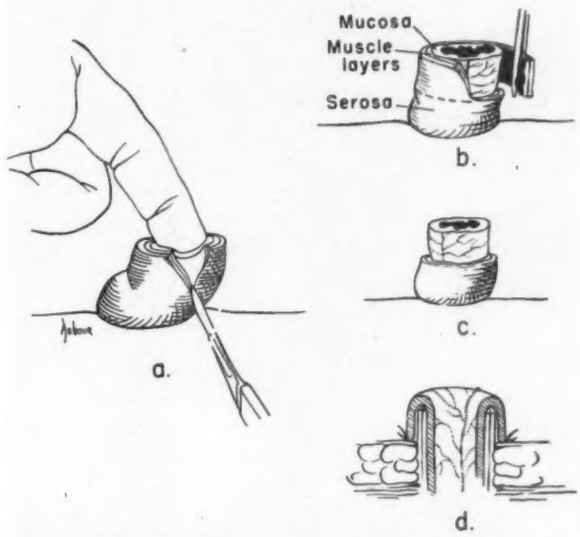

FIG. 18. The "turn-down" technic of preparing the stoma, thus hastening the maturation of the stoma in the operating room at the time of surgery. (a), The serosa and muscularis are slit much as in doing a Ramstedt operation, carrying it down to mucosa. (b), Serosa and muscle layers are stripped free, being careful to maintain the circulation of the mucosa. (c), Mucosal cuff now ready for turning. (d), Cuff is turned down to the skin level, covering the serosa, and is sutured, thus preventing the serosal peritoneal reaction which so often causes ileostomy dysfunction. (After TURNBULL, R. B., JR. and CRILE, G., JR. Mucosal-grafted ileostomy in the surgical treatment of ulcerative colitis. *J. A. M. A.*, 158: 32–34, 1955.)

me to do creative, constructive work and to bring up a fine family."

CASE REPORTS

CASE 1. O. A. (HFH No. 701677), a sixty-five-year old white farmer and father of eight children, was admitted to Henry Ford Hospital on January 1, 1953. His chief complaint was acute rectal pain with associated diarrhea and blood in the stools of one month's duration. A long, chronic history of bouts of "bloody diarrhea" with watery stools mixed with blood and pus was later elicited. These had occurred periodically for the past forty years and had required three periods of hospitalization because of chills, fever and evidence of toxemia.

FIG. 19. Case 1. A sixty-five year old white male farmer who carries on a normal farm life and travels as desired.

Physical examination revealed a well developed, pale, white male with acute rectal pain and bloody diarrhea. Abdominal examination was negative except for liver enlargement to 2 cm. below the costal margin. Examination of the rectum revealed a perianal abscess which was incised and drained. Digital rectal examination revealed marked anal spasm. Proctoscopic study showed advanced scarring and ulcerative lesions of the rectum. Sigmoidoscopic examination disclosed classic mucosal ulcerations: friable, shaggy mucosa, pale and edematous with bleeding points and evidence of scarring and narrowing.

Barium enema roentgenograms were taken, and advanced scarring and shortening of the colon were seen, together with distorted mucosal pattern throughout. Pseudopolyposis was present in both right and left colon.

A preoperative consultation with the cardiorespiratory division revealed normal cardiac findings; blood pressure was 130/75, pulse 72.

Laboratory findings were as follows: Complete blood count showed a marked anemia of the microcytic hypochromic, chronic blood loss variety. Hemoglobin, 10.2 mg. per cent; red blood cells, 3.12 million; normal differential and no leukocytosis. Wassermann test was negative; blood sugar and non-protein nitrogen within normal range; albumin, 4.04; globulin, 2.29; prothrombin 100 per cent; van den Bergh test 0.65 direct and 1.3 total. Cephalin cholesterol, thymol turbidity and thymol flocculation tests were within normal limits.

Although this patient's liver was enlarged, this was thought to be due to the toxic absorption; hepatomegaly with reduced liver function is not at all uncommon in ulcerative colitis.

Because of the chronicity of this patient's disease, danger of malignant degeneration of pseudopolyps and recurrent blood loss, total colectomy and ileostomy were decided on as the procedures of choice. The patient's general condition and weight of 175 pounds lent themselves favorably to such a major procedure.

Preoperative preparation included repeated blood transfusions until the hemoglobin was raised to 14.6 mg. per cent. Vitamin K, sulfathalidine, saline enemas, antibiotics, penicillin and dihydrostreptomycin were given twice daily. Therapeutic doses of multivitamins were given with a low residue diet. The night before surgery a Miller-Abbott tube and Foley catheter were inserted.

On January 14, 1953, total colectomy with removal of the right, transverse and left colon and rectum was performed together with ileostomy. Extensive typical evidence of advanced ulcerative colitis with thickened edematous mesentery and scarred, contracted colon was found.

The patient's immediate postoperative course was uneventful except for elevation of temperature to 100°F. He was ambulant on the second postoperative day. However, one week after operation sudden epigastric and retrosternal pain, hypotension with a blood pressure of 78/40, severe dyspnea and pallor developed. Rales were heard in the right anterior lung field and electrocardiogram and roentgenogram of the chest confirmed a pulmonary infarction. Oxygen and morphine were administered immediately. It was noteworthy that no calf tenderness had been noted and Homans' sign was absent. The patient was placed on anticoagulant therapy (heparin). Meanwhile, continuous suction with a Levin tube and a Miller-Abbott tube was maintained

to reduce abdominal distention. Intravenous glucose and water and saline with multivitamins were given, supplemented as needed with potassium chloride during periods of slight hypokalemia. Infection was combatted with combination antibiotics (penicillin and dihydrostreptomycin).

Ileostomy care consisted of frequent dressings and scrupulous skin care, painting with tincture of benzoin and aluminum paste around the ileostomy site. The wound was exposed to a bedside lamp for fifteen minutes three times daily, and was protected from contamination by the ileal contents with a rubber dam.

By the twenty-first postoperative day the patient was out of danger from pulmonary infarction. He was again ambulated and taught to take care of his ileostomy, using a Koenig-Rutzen bag.

On February 28, 1953, he was discharged to his home. He was seen one year later and had remained well, had a good appetite, was comfortable and active using his ileostomy bag. He had no symptoms and was in good general health, doing his regular farm work daily. (Fig. 19.)

FIG. 20. Case 11. A thirty-four year old mother who now weighs 140 pounds and enjoys a happy life following ileostomy.

CASE 11. B. D. (HFH No. 221761), a thirty-four-year old mother of three children, was admitted to Henry Ford Hospital July 9, 1951, with the complaint of watery, bloody diarrhea of two months' duration. For eleven years she had recurrent bouts of fever, diarrhea, bloody stools, weight loss and, during acute attacks, stools ranging from five to twenty-four daily. She did not get along with her husband or children. Her present attack began while she was several months' pregnant with her last child (now eighteen months old). Her weight had gone down from 142 to 90 pounds in two years' time.

Past history revealed only nausea and vomiting of pregnancy. She had had two hospitalizations in the past year for joint pains, fever and toxic symptoms referable to ulcerative colitis. She had received eighteen blood transfusions recently, and had been on antibiotics including sulfadiazine, aureomycin and penicillin. ACTH, liver extract injections and vitamins had all failed to stop the diarrhea.

Physical examination revealed a thin, pale, emaciated, anemic, white female. Examination was otherwise not significant. Proctoscopic study showed a rectal stricture 1 inch above the anal sphincter. Stool culture for study of parasites and allergy investigation was negative.

Laboratory findings were as follows: hemoglobin, 9.3 gm. per cent; red blood count, 3.44 million; leukocytes, 3,850 with normal differential; prothrombin time, thirteen seconds or 100 per cent. Non-protein nitrogen and blood sugar determinations were normal. Total blood protein was borderline 5.13 with albumin 2.42 and globulin 2.7. Cephalin-cholesterol was negative; thymol turbidity, 4 units and thymol flocculation, negative.

On July 18, 1951, after adequate preoperative preparation, ileostomy was performed, bringing functioning ileostomy from the lower part of the incision and the distal barrel from the upper limb of the incision.

The patient's postoperative course was stormy as she resisted all efforts to get her to eat. Her fluid and electrolyte balances were tipped from acidosis, alkalosis and hypokalemia. Her blood dropped to a dangerously low level of

anemia with 6.6 gm. per cent of hemoglobin at one time due to a massive loss of blood per rectum; her refusal to eat and the toxic infection of the remaining colon also contributed to her debility. She dropped in weight from 90 to 72 pounds and the problem of skin care was ever present.

Finally, after a month of repeated bouts of electrolyte imbalance and its correction with intravenous fluids and polyethylene tube feedings into the jejunum, the patient's appetite began to pick up.

A small fistula developed in the ileostomy about 1.5 cm. above the skin surface, but this did not interfere with its function.

The patient's blood, electrolyte, fluid and protein balance was maintained with repeated small transfusions of whole blood, Ringer's lactate and protein hydrolysate. With these added body-building boosts, the patient rallied and was discharged on September 30, 1951.

In the interim at home, she gained weight rapidly from 72 pounds at her lowest point to 133 pounds. However, she remained toxic, continued to pass blood per rectum and was readmitted six months later on March 16, 1952, for removal of her diseased colon.

On March 21, 1952, after preoperative preparation, total proctocolectomy was performed and a revised ileostomy was made.

This time her postoperative course was very smooth, with no bouts of fever, anemia, fluid or electrolyte imbalance. On April 3, 1952, the thirteenth postoperative day, she was discharged with a Rutzen bag in place which she used skillfully.

Postoperative follow-up visits in June, 1952 and January, 1953 revealed that the patient was doing well and had gained weight up to her original weight of 142 pounds. (Fig. 20.) She had been divorced, was keeping company, and had adjusted psychologically very well to her ileostomy.

One point we learned from the care of this patient was to have the dietitian keep an accurate diet diary on the patient with reference to the grams of protein, carbohydrate and fat and caloric intake. In this way, the surgeon can determine if weight loss is to be expected and supplemental tube feedings can be given if indicated. The patient should be weighed at intervals of several days; however, if done too often it may discourage the patient since weight gain may be slow.

Not until we followed such a plan was this patient able to make a real weight gain.

Case III. K. W. (HFH No. 621485), a thirty-six-year old white man, was father of twin boys aged twelve and a boy of six. The patient's condition was first diagnosed as chronic ulcerative colitis in 1948 by the gastrointestinal division of the Henry Ford Hospital. In September, 1950, he was admitted because of recurrent diarrhea dating back to 1944. Stools were mixed with mucus, pus and blood during an acute attack, and he passed as many as ten to twenty stools a day.

Excessive hard work under tension precipitated diarrheal attacks. His trouble dated to World War II, when he was declared essential and instead of going to war remained on the job as a lens grinder. This gave him a guilt complex and he believed he should have been in the Army. To rationalize and compensate for this he began working longer hours, ranging upward of sixty hours a week. Under the stress of guilt, heavy, tense, tedious work and the responsibility for his family, he had a breakdown and began having bouts of acute diarrhea.

In September, 1950, proctoscopic examination revealed many pinpoint ulcerations, edema and redness in the rectum and sigmoid colon. Confluent ulcers did not have the appearance of amebic ulcers. No pseudopolyps or malignancy was noted. The rectal wall was stiffened and narrowed.

A barium enema roentgenogram showed fuzzy outlines of the ascending, transverse and descending colon compatible with ulcerative colitis. Stool culture was negative for amebiasis or other pathogenic organisms. The patient was discharged on a medical regimen and did fairly well, moving to Arizona. However, on a vacation in California he went off his diet, ate highly seasoned foods and got stranded in the desert when his car broke down. He returned to Arizona with acute diarrhea in September, 1953. He sold his car and home in Arizona, and returned to his home in Indianapolis in almost a psychotic state with suicidal tendencies. Gastroenterologists gave cortisone, ACTH and sulfa orally without benefit. He changed doctors, and was given chloromycetin for a "perforation." During this hospital stay in Indianapolis, he had a massive rectal hemorrhage requiring twenty pints of blood.

On October 29, 1953, he was admitted to Henry Ford Hospital.

Physical examination revealed a thin, hollow-cheeked, chronically ill patient, 5 feet, 9 inches tall, weighing only 107 pounds. His chest was thinly clothed, his abdomen scaphoid; the colon was not palpable. No distinct localized tenderness of the abdomen was noted.

Proctoscopic examination showed mucus, blood and pus in the rectum. The mucosa was reddened with fine pinpoint ulcers and confluent ulcers. No pseudopolyps or carcinoma was noted. There was marked narrowing of the rectal wall and a stricture 4 inches above the anus. No perirectal abscess or fistula was noted.

Warm-stage stool study disclosed no parasites, only blood, pus and mucus.

Laboratory findings on admission disclosed slight anemia with hemoglobin of 13.3 gm. per cent and red blood count of 4.82 million. Leukocytes were 6,200 with normal differential. Blood sugar and non-protein nitrogen, prothrombin and total protein were all normal, as was the urinalysis and liver function tests. Sedimentation rate was 37 mm.

On November 6, 1953, phlebothrombosis of the left deep calf veins developed, a frequent complication of ulcerative colitis. The patient was given anticoagulants without further complications.

On November 25, 1954, a barium enema roentgenogram depicted acute active ulcerative colitis with pseudopolyp formation. (Fig. 21.)

FIG. 21. Case III. Barium enema roentgenogram showing typical ragged mucosal markings of chronic ulcerative colitis.

Because of the patient's general condition and intractability to medical management, hemorrhage and rectal strictures, total colectomy and ileostomy were decided upon.

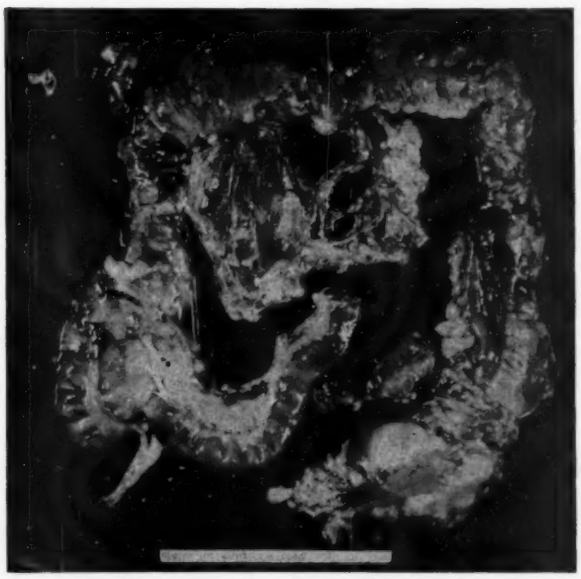

FIG. 22. Case III. Gross pathologic specimen of terminal ileum, entire colon and rectum removed at operation.

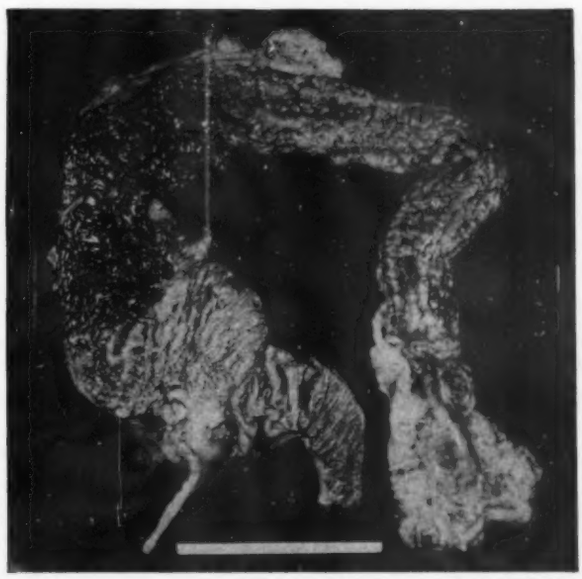

FIG. 23. Same case. Gross pathologic specimen of the colon and rectum opened, showing hemorrhage nad pseudopolyp formation and ulceration.

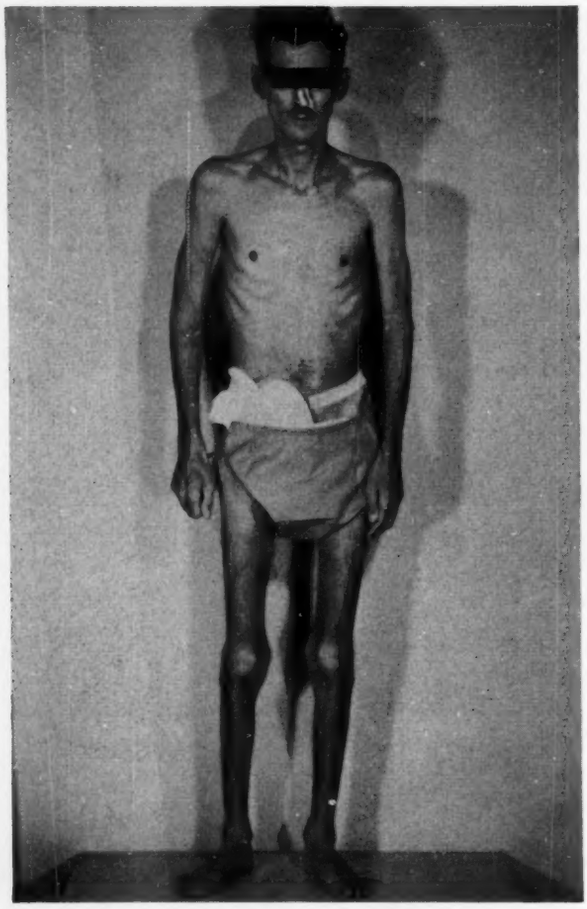

FIG. 24. Case III. The patient one week after operation, wearing a Torbot bag and weighing 71 pounds.

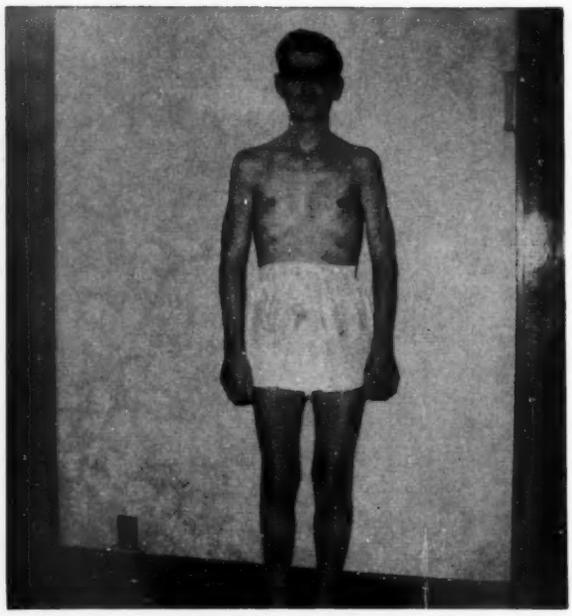

FIG. 25. Case III. The patient six months after operation, with a present weight of 140 pounds, in good nutritional state, living a normal life and working daily.

Preoperative preparation of the patient included sedation, transfusion, bowel preparation including enemas, terramycin and a clear liquid diet for three days prior to surgery. A Miller-Abbott tube was inserted. On the morning of surgery, No. 5 ureteral catheters were placed in both ureters and a rectal tube and a Levin tube were inserted.

On November 30, 1953, total proctocolectomy and one-stage ileostomy were performed. Because of the friable, diseased nature of the bowel it was a difficult and tedious procedure. (Figs. 22 and 23.)

Postoperatively the patient's electrolytes were carefully studied. He was transfused again and given protein hydrolysate and intravenous glucose and saline.

On the seventh postoperative day distention and abdominal cramps were present and the ileostomy stopped working. After irrigation and insertion of a catheter, drainage resumed but the patient had a poor appetite and small capacity for food. (Fig. 24.)

On the tenth postoperative day the patient's morale and mental state were very low, and he refused to eat.

On the eleventh day a fistula formed in the ileostomy at the skin level; this required a revision of the ileostomy.

Three days after revision immediate postoperative edema of the stoma was noted and this continued until a second skin-level fistula developed.

On the twenty-first postoperative day a second major revision of the ileostomy was necessary for a skin-level fistula and abscess at the base of the ileostomy and peritoneal margin.

One month postoperatively marked skin irritation from drainage developed and the patient had to be placed prone on a Foster frame because of the severity and depth of the erosion. This granulated readily and the patient was discharged to his home on January 18, 1954, on a high caloric diet and wearing a Rutzen bag. (Fig. 25.)

This patient pointed up several points in the postoperative care of the ileostomy: (1) Frequent small feedings of a high caloric diet are important to maintain a patient in good nitrogen balance and with good morale. (2) Good

skin care is of paramount importance if erosion is to be avoided. (3) A skin-level fistula never closes spontaneously and requires ileostomy revision.

SUMMARY

1. The surgical treatment of chronic ulcerative colitis, in selected cases, may now be streamlined safely to one-stage total colectomy with removal of the rectum and ileostomy in one operation.

2. The advantages of this procedure are: (1) it is technically feasible; (2) it avoids multiple operative procedures with the attendant risks; (3) it is performed when the patient is usually in better general condition, at the beginning of his illness, not after he has had two or three operations; (4) it avoids the difficulty of building up the patient while he still has a diseased colon; (5) there is an excellent psychic effect in that the patient is cured in one operation. Many patients will not submit to staged procedures.

3. Complications are avoided, such as later foci of infection in the remaining colon, perforation, peritonitis, hemorrhage, rectal stricture, fistula, abscess and segmental ulceration, and pseudopolyposis and malignant degeneration.

4. The danger of malignant degeneration in ulcerative colitis is emphasized.

5. To obtain a good result, both the colon and rectum must be sacrificed and permanent ileostomy performed.

6. Indications for ileostomy and total colectomy are: chronic invalidism, perforation, hemorrhage, toxicity, arthritis and dermatitis, stricture and malignant degeneration.

7. The preoperative preparation of the patient should place him in optimum fluid and electrolyte balance, with adequate hemoglobin and serum protein, plus control of infection with antibiotics. Above all the patient should be conditioned psychologically to his operation and the ileostomy care that is to follow.

8. The operative procedure is described with the conservative removal of the rectum to retain the nervi erigentes and normal sexual potency as well as the anal sphincter for its beneficial psychic effects.

9. The all-important 2 inch area of the ileostomy is emphatically stressed, and adequate time and extreme care should be taken in fashioning the ileostomy, for the success of this entire major procedure is dependent upon how this stoma functions.

10. Methods of ileostomy drainage and tips on operative technic are offered.

11. Postoperative care is primarily designed to anticipate rather than to combat complications, especially fluid and electrolyte loss and to understand the physiology of the ileostomy.

12. The ileostomy patient does not see the end of life with his operation. Actually, he begins a new life, slightly altered. Weight gain, new mental outlook and new vistas of life are possible, as shown by the many ileostomy patients who have adjusted to normal lives once more.

As we stated at the outset, this is but one way to handle the surgical management of chronic ulcerative colitis, not the answer to the condition. Let us all hope that some original research as to the true nature of this illness may soon be discovered. Until then, one-stage total proctocolectomy and ileostomy are preferable to the multi-stage operations surgeons were forced to use in the past.

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Cervical Pregnancy

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THE learned and versatile Sir Everard Home performed a postmortem examination of the inner genitalia of a young servant maid in London in 1817. The maid had died suddenly in an epileptic fit and not much had been known regarding her history, except that she had missed her menstruation about eight days prior to her death. The uterus, showing signs of pregnancy and having been hardened in alcohol, was examined by Home because he expected to gather some knowledge "on the passage of the ovum from the ovarium to the uterus." He laid open the uterus from behind very carefully and found an implanted ovum underneath an elevation of mucosa of the anterior wall near the cervix which Home [27] proudly stated was "beautifully represented in the drawing." (Fig. 1.) Without question, Home's treatise represents the first-known written report on a pathologic low implantation of a fertilized ovum.

With every event one can associate a probability. The chance that cervical pregnancy will occur is exceedingly rare. However, we have no means of estimating the frequency of the occurrence of cervical gestation in the process of human reproduction (as we know, for example, the incidence of multiple pregnancies). The number of articles on this subject up to the present are too few in order to draw statistical conclusions. Thirty years ago it was stated by the senior author [44] and has been repeated

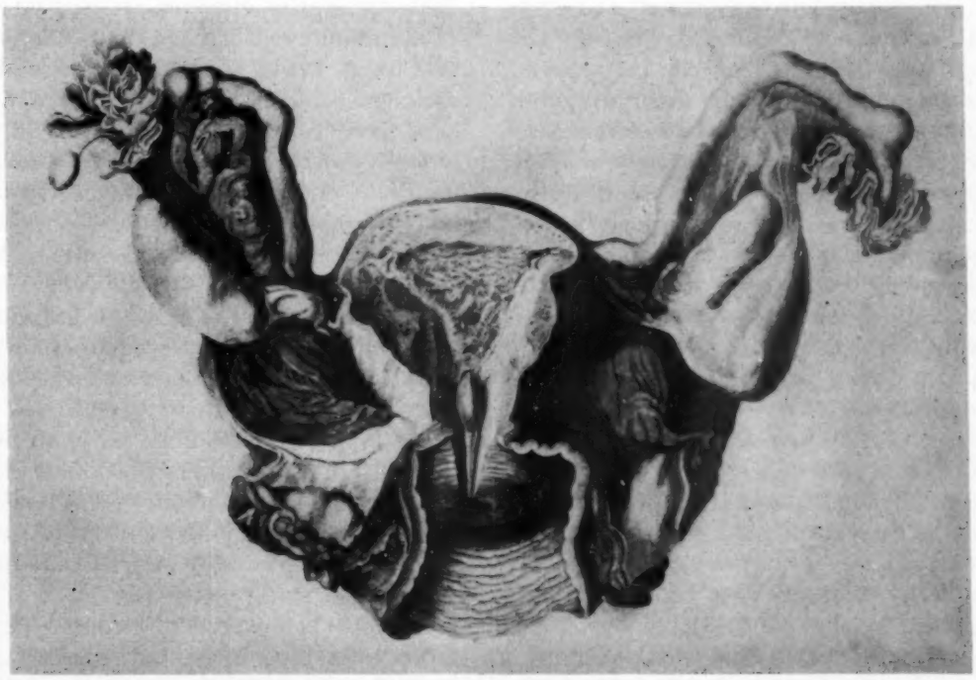

FIG. 1. Drawing shows the uterus normal sized, the tubes and ovaries four times enlarged. (Reproduced from: HOME, E. On the passage of the ovum from the ovarium to the uterus in women. *Phil. Tr., London*, 2: 252, 1817.)

since by many others, that cervical pregnancy most probably occurs more frequently than generally has been assumed. This was based on the conjecture that distally implanted ova frequently are being aborted in an early, relatively asymptomatic stage, or at least under conditions which do not attract particular attention.

It is not the purpose of this paper to survey all cases of cervical pregnancy, true and alleged ones. Rather, it is intended to call attention to certain clarifications in the terminology of this type of gestation and also to present a case, almost unique from the clinical point of view as well as from the concomitant pathology. A comprehensive list of world literature, pertinent to this problem, is also included.

Under normal conditions the corpus uteri, vested with a mucosa especially suitable for the requirements of pregnancy, provides the exclusive ground for placentation; the isthmus, which is incorporated at an early time into the cavity harboring the fetal sac, serves only for the attachment of the membranes; the cervix has nothing to do either with the membranes or the ovum. In pregnancy the cervix serves to seal off the uterine cavity from the vaginal tract; during parturition it forms a part of the birth canal.

Under exceptional circumstances, however, the fertilized ovum may imbed itself in the mucosa of the isthmus, or of the cervix. Although the nidation in the isthmus is no doubt a pathologic one, it is not to be regarded as ectopic; since by its very nature the isthmic mucosa represents a corporeal mucosa, differing from the actual endometrium corporis by its lesser development as well as a decided weakness. The cervical mucosa, on the other hand, differs basically from the mucous membrane of the corpus and isthmus. It does not prepare itself and is in no way equipped to nourish the ovum or to fulfil the other requirements which the growing fetus demands of the maternal tissue. For this reason this type of pregnancy may be termed a *true ectopic pregnancy* and, in contrast to the ectopic pregnancy proximal to the uterine body, it may be designated as *distal ectopic pregnancy*. This terminology is further justified by the fact that the pathologic changes associated with this distal ectopic gestation are fundamentally the same as those of a tubal or proximal ectopic pregnancy, i.e., consisting in the destruction of its nutrient medium and an almost regular premature termination by internal or external rupture of the gestational sac. The structure, as well as the topographic position of the cervix, however, bring about differences which are conspicuous especially on viewing the clinical picture.

The term "cervical pregnancy" was first mentioned in the literature by the Viennese pathologist Rokitansky [*42,43*]. Reading the detailed description of the pathology he had in mind, there is no doubt that his concept of the term does not coincide with the present views. At that time, about ninety years ago, the expressions vaginal pregnancy and cervical pregnancy were loosely used to denote the dwelling of the expelled products of conception in the vagina or cervix respectively. Rokitansky's "cervical pregnancy" comes nearest to what is now called cervical abortion. Cervical abortion however, is not the cervical stage of an ordinary abortion, as it is occasionally defined. It is, rather, an entity in itself. It is a certain pattern of abortion. According to Bumm [*5*], cervical abortion is considered an abortion in the early months whereby the entire, intact ovum is expelled *en bloc* from the uterine cavity but retained in the dilated cervix because of an unyielding ring of the external os. Because of the outward, deceptive similarity of the manifestations of a cervical abortion and of certain types of cervical pregnancy, these conditions have frequently been confused by superficial observers. Many an examiner has initially misinterpreted the rare cervical pregnancy as the more common cervical abortion before learning the diagnosis on further observation. It is, however, unfortunate that quite a few cases of obvious cervical abortion have found their way into the literature under the heading of cervical pregnancy, even in the last decade. Having discussed the differential diagnosis more extensively in a previous paper [*45*], it may suffice to point out here a clinical feature of differentiation, namely, that whenever one reads about the amazing lack of hemorrhage in an alleged cervical pregnancy one may be reasonably certain that the author is dealing with a cervical abortion.

The most scholarly and comprehensive paper on cervical pregnancy, covering all pertinent literature from 1817 to 1924, quoted in only two earlier publications [*44,45*], was written by a senior medical student. Mueller's classic paper

on the subject "De Implantatione Ovuli Isthmico-Cervicali" has been somewhat lost as it was published as a graduation thesis, available only on request. His extensive list of references is reproduced herein (see Additional Bibliography). Reviewing and scrutinizing approximately sixty publications on all kinds of pathologic distal placentation, ranging from the deep-seated placenta which sends a small lobe down beyond the internal os to the "true cervical placenta" that seems to have been implanted exclusively distal to the internal os, Mueller came to the conclusion that none of these patients offered definite proof of exclusive cervical placentation. In agreement with these conclusions, Pankow [*39*] made the statement, about the same time, that a true cervical placenta (implying that the ovum was exclusively and completely lodged in the cervix and that the primary implantation took place there) had never been definitely observed.

The publication [*44*] of a case of a two month old pregnancy in the vaginal portion of the cervix in 1926 enabled the senior author to present evidence for the first time that an implantation of the ovum in the cervix actually does occur. From the time of Mueller's thesis in 1924 to the present, fifty-two papers have been published claiming more than sixty cases of cervical pregnancy. Except for three which were available only in excerpts, all of these papers have been carefully reviewed in the original form by the senior author, with the special aim of ascertaining the proof of a primary cervical implantation (distal ectopic). To the present time, only seventeen of the published cases are acceptable cases of placentation restricted to the cervix. These seventeen cases, in which the zygote engrafted itself in the cervical mucosa, are dependent upon the assumption that the site of nidation and the site of placentation are identical.

Twelve of these cases were extensively discussed ten years ago [*45*] and an attempt was made to collect from the history a common denominator as to the pathology, diagnosis and therapy of cervical pregnancy. Only five cases were added to the previous list of twelve proved distal ectopic pregnancies of nineteen cases published in the last decade. These are the cases of Dougal [*15*], Dubuis [*16*], Marsh and Schuyler [*33*], Kovačev [*32*] and the latest of McInroy and Kelsey [*34*].

If the development of the placenta is to be correlated to an implantation of the ovum in the cervix, the placental site in the cervix may not or should barely trespass the boundary between the cervix and isthmus. On the extirpated or necropsy specimen the microscopic evidence of this boundary is indispensable for the diagnosis of a cervical pregnancy in its strict sense. In case of an early pregnancy, situated in the distal portion of the cervix and accessible only to clinical exploration, the presence of an intact upper portion of the cervicoisthmic canal is acceptable as evidence of a cervical implantation when considered with other observations such as age of pregnancy, size of ovum and uterine measurements.

Fulfilling these requirements, four of the aforementioned additions [*15,16,33,34*] to the list of distal ectopic pregnancy were located solely in the vaginal portion of the cervix, while one [*32*] was located in both the vaginal and supravaginal portion. The earliest cervical pregnancy ever observed was the four week old case of Marsh and Schuyler [*33*], situated in the anterior lip. As is so characteristic for these unusual pathologic events, not one was initially recognized as cervical placentation. Four of them were first thought to be a growth or a "tumor" until histology revealed the real facts. In the fifth case [*32*], in which the placenta involved both parts of the cervix, the first impression was that of a cervical abortion. Three [*16,33,34*] of these five patients were treated conservatively and two [*15,32*] underwent hysterectomy. One case deserves a more detailed report because of the extraordinary consequences which resulted from a mistaken diagnosis.

In this case of Dougal [*15*], carcinoma of the vaginal cervix, stage I, was diagnosed and the patient admitted to the hospital for Wertheim's operation. The clinical history and findings on palpation were so typical of cervical carcinoma that neither a speculum examination nor a biopsy was included in the preliminary investigation. Indeed, it was not until the cervix was inspected at the conclusion of the Wertheim operation that any doubt arose as to the correctness of the diagnosis. Histology brought the solution to this clinically undetected case of cervical pregnancy.

It would seem appropriate at this point to summarize certain facts which appear important concerning cervical pregnancy.

1. In the past thirty years proof has been

accumulated through a considerable number of cases (seventeen) that nidation of the zygote in the cervical mucosa does occur, a fact previously considered improbable although theoretically possible. Only such cases should be designated as proved distal ectopic pregnancies, primary cervical pregnancies or genuine cervical pregnancies in which the placentation is restricted to the cervix distal to the *os internum histologicum cervicis uteri.* No pregnancy older than twelve weeks was amenable to anatomic proof. These seventeen cases included pregnancies in the vaginal portion as well as in the upper part of the cervix.

2. The majority of reported cervical gestations are not amenable to this proof. Some have been considered by their authors as clinically possible, or probable primary cervical pregnancies. Other cases have been reported as proved by offering insufficient, inconclusive and misleading evidence. Among the most common errors committed are the following: first, the assumption, without discrimination, that any narrowing above the site of placentation is identical with the internal orifice; second, the conclusion that a gestation is restricted to the cervix because the cervical curettings demonstrate cervical glands plus the presence of chorionic villi, while the curettings from the corpus do not show villi; and third, the lack of adequate, anatomic-histologic evidence in patients in whom the uterus was extirpated or the specimen obtained postmortem.

3. In the majority of patients the cervical placenta apparently extended upward into the isthmus or isthmus and corpus. Nevertheless, it is not erroneous to apply the clinical term "cervical pregnancy" to all these cases because obviously the gestation was, by far, predominantly situated in the cervix. It is open to discussion whether they might be considered as ectopic pregnancies, although the Quarterly Cumulative Index Medicus catalogs them this way. For years this book has cataloged cervical pregnancy under Extrauterine Pregnancy, a glaring example of *contradictio in adjecto.*

4. A well developed *decidua* exists only in the corpus uteri, in contrast to the *decidual reaction* which may occur in the vicinity of an ectopic implantation. The decidua as a regulating organ checks the reckless, destructive advance of the chorionic villi. The lack of this protective device in the cervical mucosa is responsible for the development of the placenta accreta, increta, percreta and dissecans, and the rupture of the wall in cervical pregnancy. The destruction of its matrix is the most outstanding feature of pregnancy in the cervix.

5. One is inclined to believe that cervical pregnancies which are not acceptable as primary because they have transgressed into the isthmus or isthmus and corpus are even more important from the clinical point of view. They constitute the majority of reported cervical pregnancies. Because they represent gestations in a further and more developed stage, they are accompanied by even more dreaded and formidable symptoms. The hemorrhage which occurs on separation of the placental tissue, in most instances completely unexpected, is described as violent, profuse, furious and uncontrollable. Associated with the most variegated clinical implications, these cervical pregnancies are the cause of hectic moments for the surgeon.

The following case report describes a cervico-isthmic pregnancy, with rupture into the parametrium and with late secondary hemorrhage necessitating hysterectomy.

CASE REPORT

A thirty-four year old white married woman, who had lived in South America for eight years, was admitted to Beth Israel Hospital, New York, in November, 1954.

She had given birth thirteen years prior to admission. Since then she had had five induced abortions. Three were terminated by curettage and two resulted in clinical infection, the last being in 1946. In 1949 she had amenorrhea for ten months, followed by curettage and severe hemorrhage. A large, organized blood clot was removed. She and her husband were anxious to have another child.

Her last menstrual period was on July 26, 1954, and lasted two to three days. On August 22nd spotting occurred. In early September nausea was prominent. She was admitted to a hospital and sedatives were administered. Her work-up was reported entirely negative, except for an Aschheim-Zondek test which was positive on two occasions. During October she had intermittent, cramp-like, hypogastric pains with radiation into both inguinal regions, as well as back pain. Because of the persistent pain, the patient came to New York on October 22nd, three months after cessation of her menses.

On that day a pelvic examination was per-

formed by the senior author, the first since her arrival. This revealed a soft cervix and an enlarged uterus the size of a four-month gestation, the fundus being two to three finger-breadths beneath the umbilicus. Because of the markedly obese abdominal wall, details of the shape of the uterus could not be made out. There was no localized tenderness and the adnexa were not palpably enlarged. An x-ray of the abdomen did not reveal fetal ossification points.

The next day she went to another gynecologist who placed her in a hospital, where she underwent an intensive work-up during a four-day stay. She was examined by five physicians who unanimously agreed that there was an intrauterine gestation of four months' duration.

The cause of the lower abdominal cramps was not definitely ascertained and a therapeutic abortion, which had been suggested by the patient because of her persistent pain, was not considered indicated. She was advised to return to South America and allow the situation to progress unabated.

To this point the patient presented a diagnostic problem, not only because of the unexplainable pain but also because of the overly enlarged uterus which was inconsistent with the fairly well established date of conception three months previously.

Her condition soon developed into a therapeutic problem. Two days after discharge from the hospital the membranes ruptured spontaneously and one day later, on October 30th, she experienced a slight chill and a fever of 100.3°F. She was again admitted to a hospital where she remained for three full days. During these three days she had eight episodes of chills and spiking fever, as high as 106°F. Vaginal bleeding and abdominal cramps were very slight. While at that hospital, she received intravenous fluids containing achromycin® and terramycin.® Her condition alternately improved and deteriorated. Hemoglobin dropped from 12 gm. per cent to 10.5 gm. per cent, red blood cell count from 3.5 million to 2.9 million. Repeated white blood cell counts remained around 8,000 per cu. mm. to 9,000 per cu. mm. The patient and her husband, both physicians, believed that more active treatment was in order.

On November 2nd the patient was transferred to the Beth Israel Hospital. Pelvic examination revealed an enlarged uterus, the size of a three- to four-month gestation. The cervix was softened, admitting a fingertip, and was 1.5 cm. in length. The uterus, adnexa and parametria were non-tender. A slight pinkish discharge was noted.

Two hours after admission the patient had a severe chill which was followed with a rise in temperature to 103.6°F. She was given intravenous fluids containing pitocin® and large doses of penicillin. On the second day her temperature was only 100°F., white blood cell count was 7,800 per cu. mm. The patient experienced neither pain nor cramps and felt somewhat better. On the third day she had a chill with a temperature rise to 102°F. Blood culture and culture from a vaginal smear were reported negative after forty-eight hours. The report, however, was only a preliminary one.

We now had a three month old pregnancy that became infected after the membranes were ruptured. This apparently was a septic, incomplete abortion which did not improve after achromycin and similar antibiotics were given, but which showed a marked improvement after penicillin was administered in high doses. Significantly, the continuous pitocin drip running for three days failed to produce any uterine contractions or bleeding which one might expect in an ordinary abortion.

On the fourth hospital day it was decided to evacuate the uterus. Expecting some atony and bleeding from the septic uterus, preparation for transfusion of the patient, who was Rh negative, was made. The running pitocin infusion was interrupted by the anesthetist who gave as his reason the possible interference with cyclopropane. After consultation, the anesthetic was changed to ether.

Dilatation and curettage was started. The cervical orifice was soft and a No. 10 Hegar dilator was introduced without resistance. In quick succession Hegar dilators were inserted up to No. 15 and the cervical canal, only 1 to 2 cm. long, was dilated sufficiently to introduce a large placenta forceps. A macerated fetus was removed and a foul, offensive odor was noted. The probable age of the fetus was derived from the diameter of the collapsed cranium which was 2 cm., corresponding to an embryo of almost three months.

The moment the placenta was grasped with a sponge forceps and removed, a sudden, violent, light red gush of blood came from the cervical opening. If one had cut the abdominal

aorta transversely, bleeding would not have been more severe. Fast curetting, using sharp and blunt curettes, was done and sponge forceps were employed alternatingly in order to clean out the uterus. Within two minutes the patient lost about 1,000 cc. of blood and the anesthetist announced that no pulse was palpable. Anesthesia was stopped and pure oxygen was given. Breathing and skin color were satisfactory. Pitocin, 1 cc., was given intravenously and the second 500 cc. bottle of blood was started.

While the uterus was being emptied, the following findings could be ascertained: The cavity immediately proximal to the cervical opening felt like a paper-thin, spherical shell and measured 8 cm. in diameter. After the uterus contracted and the bleeding decreased, it could be felt with the curette that the fundus and the upper part of the uterine body formed a firm, resistant and thick-walled cavity, about 3 to 4 cm. long, around the curette's sling, whereas the cavity between this roof-like formation and the external cervical os still gave the impression of a loose, attenuated sac. In contrast to the upper, well contracted part that was quickly cleaned of decidual tissue, the lower, larger part was the site of partly fresh, partly organized placental tissue that had to be removed by repeated strokes of the curette and by the use of a sponge forceps until cleaned completely.

The bleeding stopped. A total of 1,500 cc. of blood, followed by 5 per cent glucose with pitocin and penicillin was given during the following twenty-four hours. The patient remained free of chills and fever, and recovered rapidly. A blood count was taken the next day, showing a red blood cell count of 2.6 million per cu. mm. and hemoglobin of 8.5 gm. per cent.

A vaginal examination on the day of discharge (three days after dilatation and curettage) revealed the following findings: The uterus was anterior, firm and enlarged to the size of an eight weeks' gestation. There was no tenderness. The cervix was closed and short (about 2 cm. long). The transition between cervix and corpus was not of the usual pear shape but definitely ballooned-up, as could be distinctly felt through the vaginal vault. There was a very slight amount of bloody discharge.

A résumé of this case written at that time ended with the following conclusions: "This was a cervix-isthmus-low-corpus placentation which, after rupture of membranes, became infected with putrid organisms. After removal of the macerated fetus and the putrid placenta, recovery set in. The pain during pregnancy, the discrepancy between the size of uterus and duration of gestation, the ineffectiveness of intravenous Pitocin to induce labor after membranes were ruptured, and the excessive bleeding following the separation of placenta could all be explained by the above diagnosis."

From this statement only two assertions had to be corrected due to later findings. First, this was not a cervix-isthmus-low-corpus placentation but a placentation exclusively restricted to the cervix and isthmus. The corpus, as shall be demonstrated later, was not involved. Second, this was not a simple infection with saprophytic organisms but, as one could have expected from the severe clinical symptoms, an infection with Streptococcus viridans. The culture of the vaginal smear, as well as the blood culture, became positive four to five days after the cultures were taken and not, as is usual, after two days, because of the retarding effect of the penicillin-containing blood.

The patient was discharged on November 8th, three days after dilatation and curettage was performed. The patient and her husband were both warned of the possibility of a postoperative hemorrhage.

Six days after the patient left the hospital (ten days after dilatation and curettage) she telephoned to say that she had started to flow; she was lying in a puddle of blood, felt weak and had been left alone in an apartment with locked doors. She was rushed to Beth Israel Hospital in an ambulance. From eyewitnesses it was learned that her bed linen and the carpet, where she was lying almost unconscious when picked up, were drenched with blood. The blood loss was estimated to have been 1,000 cc. Her arms and legs were covered with blood crusts. The red blood cell count at this admission was 2.78 million per cu. mm., hemoglobin 8.5 gm. per cent. She was given a blood transfusion of 1,000 cc.

Hemorrhages, days and even weeks after removal of the products of conception in cervical pregnancies, are well known to anyone who has studied the pathology and history of these cases. The hemorrhages are due to defective thrombus formation in the abundant large vessels at the site of placentation where an enormous amount of erosion and destruction of the muscular wall takes place. There is only

one definite solution to this exigency, and that is hysterectomy. The necessity of undergoing a hysterectomy was explained to the patient. She refused to give her consent. She was not bleeding, felt well and stated she would rather die than have her womb removed.

The patient was told that if she would stay in the hospital for four weeks, under strict observation, a compromise would be made and she would not be operated upon, except if she were to bleed again. This was an agonizing compromise because it was known that hemorrhage threatened continuously. The time of four weeks mentioned to the patient was not an arbitrary one. The senior author remembered very well that the longest interval between interruption of a cervical pregnancy and an episode of posthemorrhage known in the medical world literature was four weeks. We had in mind a patient reported by Steinbiss [*48*] in 1928 who bled to death.

This calculated risk was taken because we had two bottles of blood typed and crossmatched and at all times ready for the patient, and orders had been given to start a transfusion at once should she hemorrhage. In this event, it was thought, one would get the consent from the patient for a hysterectomy. The patient was not allowed to leave her bed for two weeks. She remained in the hospital for four weeks; no bleeding occurred during this time and she had an uneventful recovery. The red blood cell count rose from 2.7 to 3.9 million per cu. mm. and the hemoglobin from 8.5 to 11.7 gm. per cent. Most impressive were the findings one could ascertain by regular pelvic examinations, convincing the observer that the uterus involuted satisfactorily. Significantly, the spherical, soft mass which constituted the upper part of the cervix, enclosing a big hematoma, became gradually smaller, firm and pear-shaped. After four weeks the uterus was almost normal in size, firm, freely moveable and not tender. The cervix was firm and closed. The vaginal discharge, which at the beginning was red and dirty brown in color, became yellow with occasional streaks of pink, and stopped completely. It was thought that even if the patient should start to bleed again, one would have to think of regular menses. The patient was informed accordingly when she left the hospital in good condition on December 11th.

Four days later, on December 15th, the patient was readmitted for the third time because she had started bleeding that morning. The bleeding was moderate in amount. The patient estimated a loss of 100 cc. of blood. Nevertheless, two bottles of blood were again made ready for all eventualities. For the next two days there was no bleeding. On December 18th, she began to bleed intermittently. At 8 P.M. she started to flow, expelled clots and telephoned; she was understandably nervous and apprehensive. A half hour later, on vaginal examination, a large blood clot was found in the vagina and there was a flow of light red, fresh blood.

It was decided to perform an emergency hysterectomy, to which the patient now, six weeks after removal of fetus and placenta, wholeheartedly, almost imploringly consented.

The operation was technically difficult for various reasons, one being that the patient was markedly obese. After the abdomen was opened there was no obvious disorder visible except for a hemorrhagic, enlarged left ovary. The uterus was anterior, of almost normal size and shape. (Fig. 2.) However, on closer inspection the bladder reflection appeared wrinkled, infiltrated and edematous. Similarly edematous were both round ligaments and the parametria. Within the right parametrium, next to the cervix, a hazelnut-sized, cyst-like, bluish translucent formation was visible. There was pronounced bleeding from all cut tissues and structures. The bladder was adherent to the cervix and could be separated only with difficulty. A low supravaginal amputation of the uterus was done. The level of amputation anteriorly was 1½ cm. below the vesical fold, posteriorly slightly more caudal, through the sacrouterine folds. In cutting transversely through these structures a walnut-sized cavity of the cervix, bulging out into the right parametrium, was opened and split through the middle. (Figs. 3 and 4.) The thickness of the cervical wall anteriorly was attenuated to the thinness of paper, posteriorly about 1 mm. These thinned-out cervical walls and the adjacent tissue were very friable with an inordinate amount of bleeding each time the tissue was manipulated. The amputated dome of the cavity was filled with a grey, necrotic coagulum that was adherent to the anterior wall of the sac-like structure, while the material, filling the distal unextirpated part of the cervical cavity, could be removed with a stroke of a sponge-stick. After the uterus and the left adnexa were

FIG. 2. A and B, anterior view of uterus showing ragged edge of transcervical amputation. The line of anterior peritoneal reflection is visible above the amputation level. Protruding through the amputated cervix is an irregular hemorrhagic mass which appears to be attached to the right anterolateral wall. The continuity of this mass with the right parametrial structures at the defect of the right cervical wall is evident.

FIG. 3. A and B, uterus opened in midline anteriorly, showing the symmetric pattern of the normal, endometrial cavity which is sealed off from the semi-spherical, cervical cavity with its markedly corroded, thinned-out wall. The dome of the cervical cavity is at the level of the anterior peritoneal reflection. The thinned-out portion of the right anterior wall has been reflected upward.

FIG. 4. Close-up of cervical cavity showing a membrane sealing off the endometrial cavity from cervical cavity with its hemorrhagic, relief-like appearance. This appearance is similar to that which has been compared by other authors to the trabecular structure of heart muscle. The attachment of the shaggy, hemorrhagic mass in the thinned-out right anterolateral wall is demonstrable.

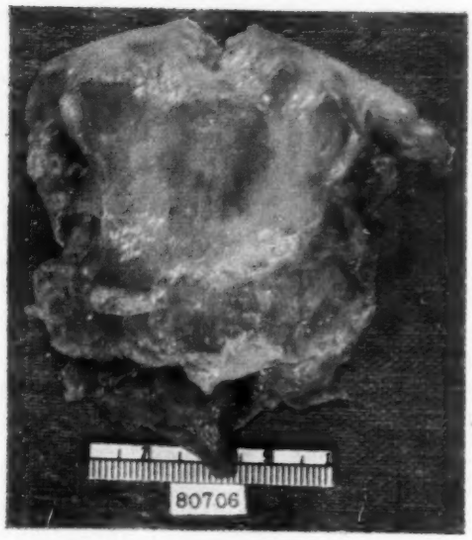

FIG. 2A.

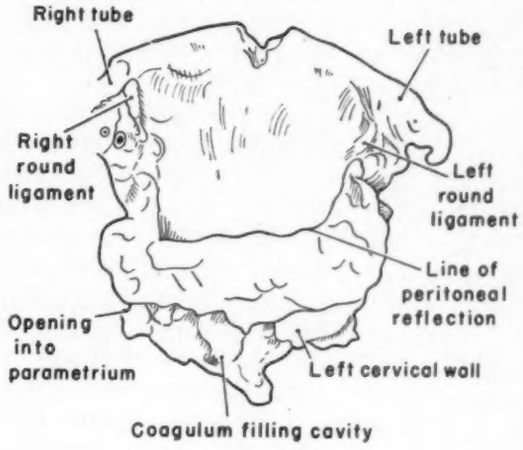

FIG. 2B.

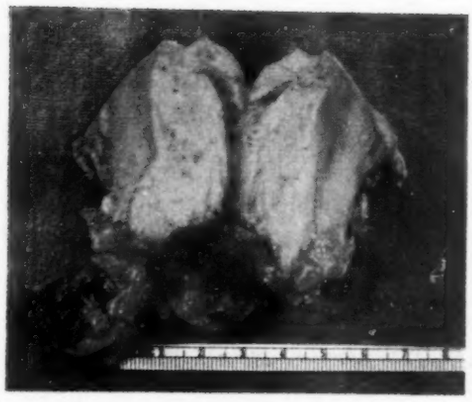

FIG. 3A.

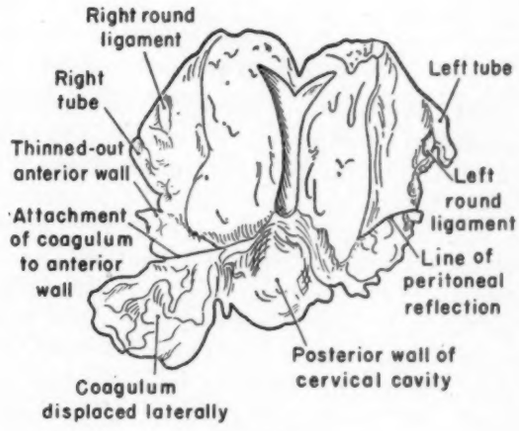

FIG. 3B.

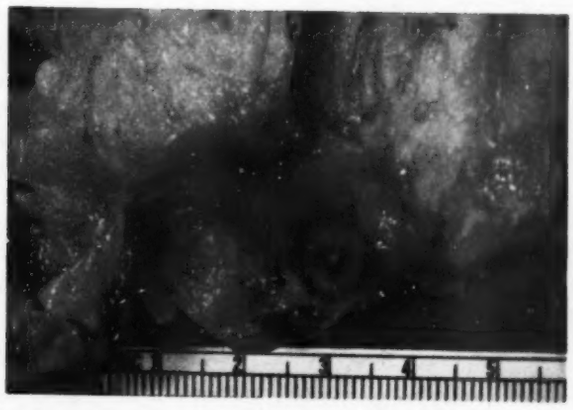

FIG. 4.

extirpated, the remaining cervical sac was sutured by single, deep-reaching stitches in such a way that the further distal, solid part of the cervix was included into the sutures, obliterating this cervical cavity and providing effective hemostasis.

Just prior to surgery the bleeding from the cervix was considered moderate; after the operation, however, the vagina was distended and completely filled with blood, mostly clots, and there was a puddle of blood between the thighs. It was estimated that at least 300 cc. of blood had accumulated distal to the cervical cavity and represented bleeding from this site, additional evidence to have justified the emergent nature of the operation. About 500 to 800 cc. of blood were lost in the field of operation. The blood loss was replaced by transfusion (1,500 cc.), and the red blood cell count and hemoglobin were higher after the operation than the last preoperative level. The patient made an uneventful recovery.

PATHOLOGIC REPORT

Gross Description (*80706*). The specimen consisted of a transcervically amputated uterus, measuring 5.5 cm. from the fundus to the level of amputation, 4.5 cm. across the fundus and 2.5 cm. anteroposteriorly. (Fig. 2.) On the anterior surface the level of amputation in the midline was 1.5 cm. below the peritoneal reflection; laterally it was 0.8 cm. The right parametrial tissue was wider than the left. The cervix above the level of amputation was dilated and measured 4.5 cm. in diameter. Attached to the right anterolateral wall of the stump near the cut surface was a shaggy, grey, hemorrhagic piece of tissue measuring 2.7 by 2.5 by 2.4 cm. which could be placed into the cervical cavity. The lower uterine segment was sealed over by hemorrhagic, grey, spongy membranous tissue which rose to a height of 1.5 cm. above the level of amputation; this corresponded roughly with the line of peritoneal reflection on the anterior surface of the specimen. The lower cavity did not communicate with the endometrial cavity because of the hemorrhagic membrane. The wall of this lower cavity measured up to 1.5 cm. in thickness and was thinnest in its right anterolateral aspect, at the site of the previously described hemorrhagic tissue. (Figs. 3 and 4.) The myometrium of the corpus measured up to 2.0 cm. in thickness and no nodules were noted. The endometrium was smooth, glistening, and measured less than 0.1 cm. in thickness.

Separately received was an adnexum (left) consisting of a segment of fallopian tube and ovary. The fallopian tube measured 4.5 cm. in length and 0.4 cm. in diameter. Within the attached mesosalpinx there were several translucent, smooth-lined cysts ranging from 0.2 to 0.4 cm. in diameter. The left ovary measured 5 by 3 by 1.5 cm. At one pole of the ovary there was a 1.2 cm. hemorrhagic cyst. The entire ovary had a hemorrhagic appearance. Separately received was an irregular piece of grey, hemorrhagic tissue measuring 1.2 by 1.2 by 0.4 cm.

Microscopic Description. Examination of the cervix at the point of the attached hemorrhagic mass revealed a blood clot showing organization. At its point of attachment there was an area of necrosis. On the surface of the cervix beneath there was an inflammatory infiltrate of polymorphonuclear leukocytes. Beyond this plasma cells, leukocytes and pigment-ladened macrophages formed the outer zone beneath this superficial area of hemorrhage and necrosis. Within this area chorionic villi were present. These ghosts of chorionic villi consisted of fibrosed villi containing few nucleated cells at their rim. These were located at varying distances within the adjacent wall. Thrombosed vessels as well as thick-walled vessels were present further within the section of the wall at this place. Some of the vessels showed recanalization; however, no fresh thrombus was noted. No cervical glands *per se* were noted throughout the sections through the right anterolateral portion of the wall.

The material attached to the cervix showed varying degrees of organization and contained thrombosed vessels. Collections of lipophages as well as pigment-ladened macrophages were present. There were areas that were very well vascularized and others which were more fibrous. Section of the left cervical wall showed a similar superficial area of necrosis and acute inflammation. Here, no chorionic villi were noted; however, at one spot racemose glands lined by columnar epithelium without any stroma were noted. These communicated with the surface which showed some columnar epithelium over an area of inflammation.

Sections of the endometrial cavity revealed a superficial area of subacute inflammation extending for a short distance into the under-

lying myometrium. Within this some pigment-laden macrophages were also present. A few endometrial glands were found here, too. They consisted of a single layer of epithelium and were surrounded by an acute inflammatory infiltrate. They were present only on the surface of the cavity. The inflammatory infiltrate in the endometrial cavity consisted chiefly of lymphocytes and plasma cells with a rare polymorphonuclear leukocyte.

Section of the ovary showed an organizing corpus haemorrhagicum.

Section of the fallopian tube was not remarkable except for the presence of a parovarian cyst.

COMMENTS

In conclusion, this case can be approached from two angles, one stressing the presence or absence of symptoms considered to be common or even typical with cervical pregnancies, and the other stressing features which are either unique or at least rare in accompanying cervical pregnancy.

Most frequently, in about 50 per cent of all cervical gestations, one will find the statement in the case history that there was a bloody discharge or irregular bleeding starting two to four weeks after the patient missed her period. Furthermore, in all except a very few cases it was a more or less massive hemorrhage following the beginning of the separation of the ovum or the rupture of the cervical wall which led to medical attention (exceptions were women with intact cervical pregnancies who had been admitted for artificial interruption of their allegedly normal gestations). In our patient only a one-day spotting four weeks after cessation of menstruation was noted. At the end of the third month of her pregnancy it was not bleeding but rather pain that caused the patient to seek medical help. Pain, however, is absent in the majority of cervical pregnancies. The absence of pain and the presence of painless bleeding are even considered to be characteristic for this type of gestation, explainable by the fact that the uterine body is not involved and hence contractions are not provoked and cramps are not felt. There are occasional remarks in the case histories that light cramps or low backache were encountered. Nevertheless, the role of pain in cervical gestations is insignificant. Only in four cases was the presence of severe abdominal pain mentioned; these cases were pregnancies of three or more months. Our case is unique insofar as it was the very occurrence of unexplainable, violent, hypogastric pain that caused the patient to leave her country and seek consultation here. The involvement of the paracervical nerve plexus and ganglion after destruction of the cervical wall must be considered responsible for this phenomenon. Another characteristic sign of cervical pregnancy in a more advanced stage, present too in our patient but not detectable because of the obesity, is the presence of a palpable uterine body above the pregnant, ballooned-out cervix. This most often is erroneously diagnosed as a fibroid tumor in a supposedly corporeal gestation. A unique fact was that this was a highly infected pregnancy, after rupture of membranes, which forced active intervention and led to the disclosure of circumstances revealing the correct diagnosis. Of course, the ever present violent hemorrhage following the removal of the placenta accreta was present also in our patient. Late secondary hemorrhages after removal of the products of conception in cervical pregnancies have been encountered by many observers. From this point of view the hemorrhage ten days after curettage falls within common experience. The second late hemorrhage, however, six weeks after dilatation and curettage, provides another unique feature to our case.

One brief remark on the operative procedure may be permissible. In many instances of cervical pregnancy it is necessary to perform hysterectomy in order to stop the otherwise uncontrollable hemorrhage during and after the separation of the placenta. However, only two cases are reported [*21,25*] in which hysterectomy had to be performed for late secondary hemorrhage. One of these was two weeks, and the other four weeks, after evacuation of the uterus. In our case hysterectomy would have been appropriate at the first episode of secondary hemorrhage; unfortunately, the patient refused operation. At the second episode of late hemorrhage, six weeks after evacuation of the uterus, subtotal hysterectomy was performed. This allowed a ready access to the source of cervical hemorrhage which was stopped by suturing the residual, distal part of the cervical cavity.

SUMMARY

1. The term cervical pregnancy is discussed and defined. Distinction is made between

cervical pregnancy in a strict sense based on primary cervical implantation and restricted cervical placentation, and cervical pregnancy in a broader sense with the implication that the placental attachment is not confined to the cervix but extends into the isthmus or isthmus and corpus.

2. A short review of five cases of primary cervical implantation, published in the last decade, is presented. These five cases, in addition to twelve previously accepted cases, increase the total of proved cervical nidation to seventeen.

3. A case report of a cervico-isthmic pregnancy is presented, complicated by severe septicemia and two episodes of secondary hemorrhage.

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Primary Reticulum Cell Sarcoma of Bone

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IN this paper an additional case of primary reticulum cell sarcoma of bone shall be presented and the current status of this disease discussed from the diagnostic, pathologic and therapeutic standpoint. The value of arteriography as an important diagnostic aid will also be emphasized.

The possibility that primary reticulum cell sarcoma of bone would originate directly from reticuloendothelial elements of the bony structures was suggested by Oberling.[27,28] Following the work of Parker and Jackson,[29] this type of sarcoma was established as a distinct entity from the clinical and histopathologic point of view. Their opinion was supported by Edwards.[10] Sherman and Snyder[35] described in great detail the roentgenologic appearance of primary reticulum cell sarcoma of bone seven years later. Additional reports by Coley and co-workers,[5,6] McCormack et al.,[24] and Ivins and Dahlin[15] represented contributions of great value toward the clarification of the diagnostic, histopathologic and therapeutic aspect of this often inadequately labeled malignant process.

The rather restricted number of cases reported even as the result of extensive studies of pathologic material available[15,24,43] over a period of a quarter of a century or more indicates that this type of bone tumor is uncommon. A critical review of the available world literature yielded, in the light of the criteria mentioned later, a total of 154 cases of primary reticulum cell sarcoma of bone, seven of which have to be considered atypical.

CASE REPORT

The patient, a sixty-nine year old white man, was seen at Roswell Park Memorial Institute with a history of several years' duration of pain and swelling in the distal portion of the left upper arm. This mass, however, did not produce any symptoms until approximately two years prior to admission when an episode of acute pain in the same location occurred. Roentgenograms taken at that time revealed a pathologic fracture through an osteolytic lesion of the distal third of the humerus. For domestic reasons no medical treatment was sought, and the patient continued to work as a janitor in spite of increasing pain, swelling and difficulty in lifting his left arm. He categorically denied any generalized symptoms.

Physical examination revealed a well nourished and well developed man in no acute distress. The distal half of the upper arm presented a large, fusiform and rather firm enlargement measuring 10 cm. in width. The skin was of normal color; however, it appeared somewhat fixed over the anteromedial aspect of the swelling. The local temperature of the involved area was not elevated. False mobility was present at the level of the tumor. The passive motion of the left shoulder joint was not limited. The active motion, however, was reduced, probably due to pain produced by contraction of the muscles inserted in the vicinity of the neoplastic process. The active and passive mobilization of the left elbow joint was limited and associated with a great amount of pain. The patient preferred to let his left upper extremity dangle along his side, claiming that this position was the most comfortable one. Elevation of the arm and flexion of the forearm were executed only with support by the healthy right hand. A mild degree of muscular atrophy of the left arm was noted, but there was no clinical evidence of peripheral nerve involvement. The left axilla contained several firm, but non-tender, enlarged lymph nodes. The remainder of the physical examination was non-contributory and a thorough work-up of the patient failed to reveal any primary or metastatic lesion elsewhere.

FIG. 1. Plain roentgenogram demonstrating destructive, osteolytic neoplasm of bony origin with pathologic fracture and pseudarthrosis formation. Note the faint calcifications within and around the tumor. Elbow joint appears free.

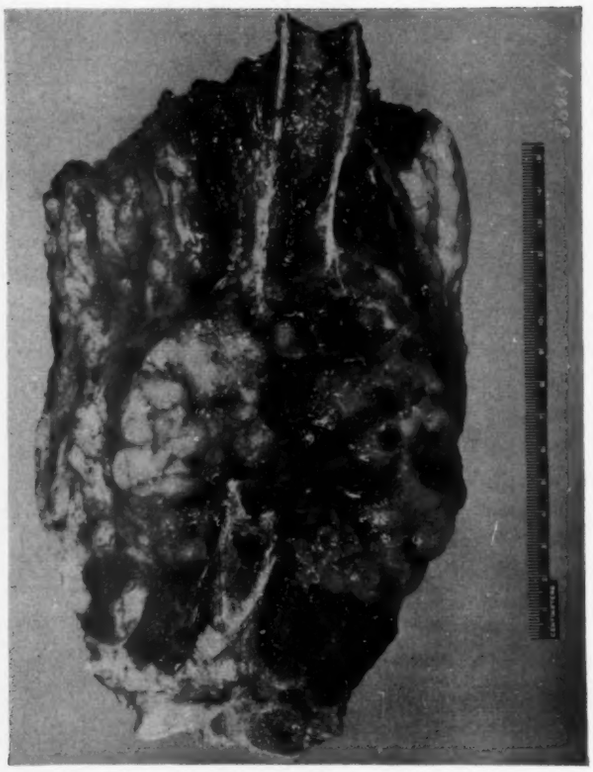

FIG. 2. Gross specimen after amputation. The extent of the bony destruction and surrounding, partly necrotic mass of soft tissue is well illustrated. Involvement of the medullary cavity is striking.

Roentgenograms (Fig. 1) of the involved lower half of the left humerus showed complete destruction of the cortex and medullary cavity with some new bone formation on the lateral portion of the tumor. There was evidence of an old fracture at the level of the neoplasm with pseudarthrosis formation and displacement of the two fragments of humerus. The surrounding soft tissues appeared involved and some calcifications around and within the new growth could be observed.

A brachial arteriogram was performed under local anesthesia and the injection of 20 cc. of 50 per cent urokon® revealed a vascular pattern characteristic for malignant neoplasms. These vascular changes will be described in detail later in the paper.

The patient was brought to surgery and an open biopsy performed. Emphasis was placed not only on the removal of a representative area of soft tissue but also of fragments of healthy bone in continuity with some involved bone. This allowed the histologist to view the important zone of transition from normal to pathologic tissue for adequate evaluation. After the frozen section was reported as "reticulum cell sarcoma," a subglenoid amputation of the left humerus was performed. The postoperative course was uneventful. One week after surgery a course of external irradiation was started employing 250 kilovolt peak with a half value layer of 2.5 mm. copper and delivering 300 r (tissue) at a focal skin distance of 50 cm. daily through two opposing anterior and posterior ports of 10 by 20 cm. for a total tumor dose of 4,536 r to the left axilla.

Follow-up examinations to the time of writing have failed to reveal any evidence of local recurrence at the site of amputation or distant metastases; the nodes in the left axilla have regressed.

Examination of the amputated specimen (Fig. 2) revealed the following data: The lower half of the humerus was involved by an osteo-

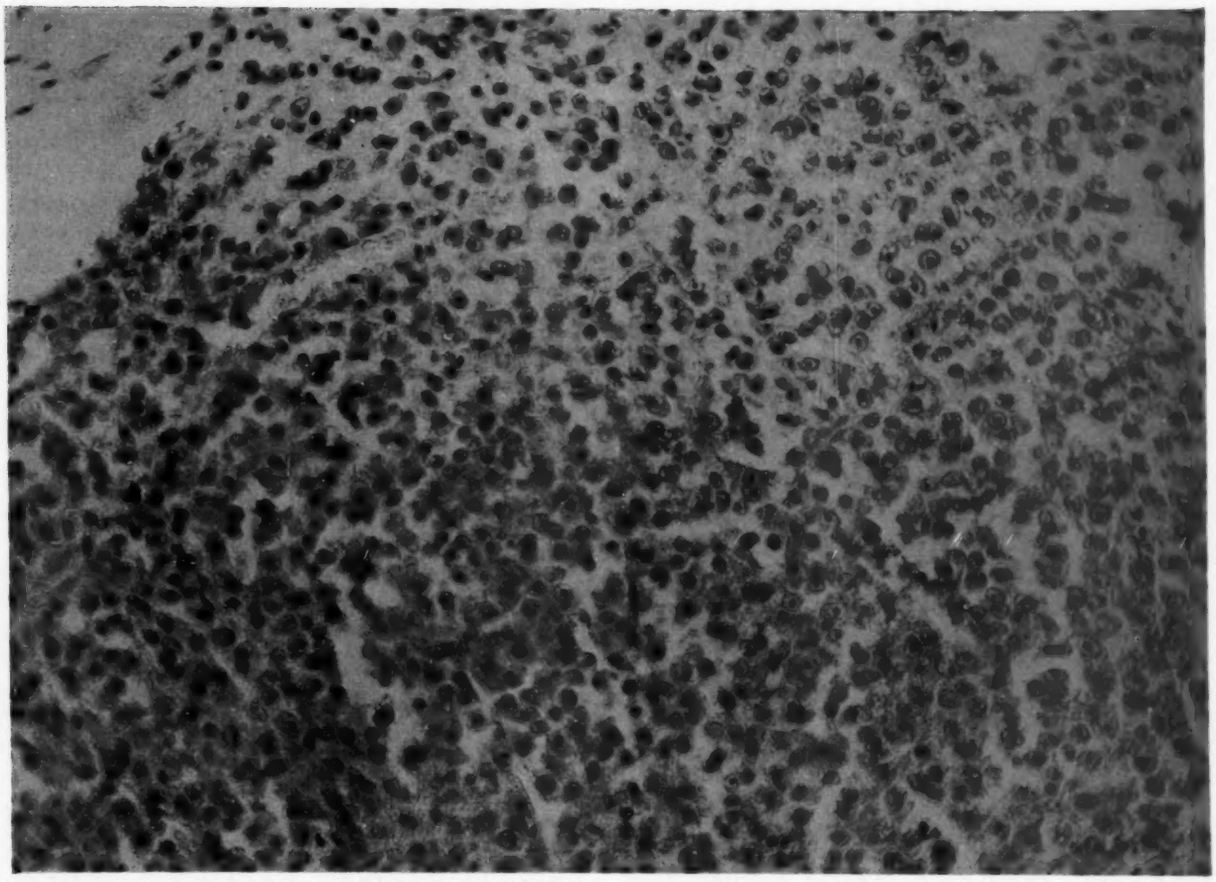

FIG. 3. Photomicrograph showing typical histologic structure of reticulum cell sarcoma; hematoxylin and eosin stain. (Original magnification × 420.)

lytic tumor of soft consistency and pink color with hemorrhagic areas (site of biopsy). The tumor measured 10 by 13 cm. in its main diameters. There was a defect of approximately 5 cm. between the two fragments of humerus. The elbow joint was not involved. The blood vessels and nerves in this area were displaced by tumor. There was invasion of the fascia of the arm. Histologically no tumor could be identified in the soft tissues, bone or blood vessels at the line of resection. The neoplasm itself was composed of cells with blue, faintly granular cytoplasm and large, mostly rounded and dark nuclei. These cells had the tendency to grow in short cords and to form masses which were separated by connective and reticuloendothelial tissue. Larger areas of the cells were surrounded by thicker bands of fibrous connective tissue. (Fig. 3.) Wilder stains showed the typical reticulum pattern.

In order that a new growth originating in bone can be classified as "primary reticulum cell sarcoma of bone" the following, well established criteria should be fulfilled: (1) The primary focus should originate in a single bone. (2) The malignant character of the lesion must be established by a biopsy specimen taken from the bone lesion itself and not from lymph nodes or other metastatic areas. (3) The pattern should be histologically similar to reticulum cell sarcoma arising in other tissues. (4) A long natural history of the disease should exist, during which time general symptoms such as debility, loss of weight and the like are rarely observed. (5) Metastatic lesions, if present on admission, should be strictly limited to the regional lymph nodes, or their appearance should follow the primary lesion by not less than six months. (6) The neoplasm should be highly radiosensitive.

Therefore, only lesions fitting these criteria should be considered as primary reticulum cell

sarcoma of bone. There are some workers, however, who believe that multicentric bony lesions may also be classified as such.[24,36,37]

Age. Primary reticulum cell sarcoma of bone may appear at any age but, as reported in the literature, is most frequently seen during the fourth decade. The peak of incidence of Ewing's sarcoma is in childhood and adolescence, while lesions attributed to lymphosarcoma involving bone do appear most frequently in the fifth decade. This difference in age distribution may, in some instances, point toward the correct diagnosis. It will be noted, however, that in the case presented herein the patient was sixty-nine years old.

Sex. In most reports available, the sex distribution favors men over women by the ratio of 2:1.

Symptomatology. The duration of symptoms universally extends over a period of many months. Local swelling, pain, disability and clinical evidence of nerve involvement, such as motor or sensory disturbances, are noted as being the most frequent complaints. The first two symptoms usually represent the main reason why medical advice is sought. Intermittent or constant pain, especially at rest, should immediately suggest the possibility of bone tumor. Occasionally the pain is referred to the nearest joint. This may lead to the diagnosis of some type of inflammatory joint disorder with resultant erroneous therapy and deplorable waste of time in establishing the correct nature of the disease with the initiation of proper treatment. Disability is often observed and may be so pronounced as to force the patient to drag the affected extremity like a useless appendage. On the other hand, disability may be the result of a vicious cycle from decreased use of the involved limb with subsequent further impairment of its function due to disuse. Swelling may be lacking. When present, it may be fusiform if located along the shaft of the bone, or globular if arising near the epiphysis. A mass of soft consistency may be considered a sign of rapid growth, while a firm or hard tumor speaks in favor of a confined lesion. Local tenderness is not a usual feature of the disease, nor are redness or increased local temperature. Once these signs are noted, rapid progression of the neoplastic process occurs. Many patients show pathologic fractures which may or may not produce pain. Such fractures may be complete or incomplete. Some observers report pathologic fractures in 25 per cent of their cases.[24]

Location. There is not any indicative site for primary reticulum cell sarcoma of bone since its histologic origin entitles this type of tumor to arise from any bony structure. Lichtenstein,[23] in this respect, classifies reticulum cell sarcomas with the malignant tumors of hematopoietic origin. However, this new growth evidences some predilection for the lower extremities and pelvic girdle, upper extremities and shoulder girdle, and vertebrae and head, in that order of frequency.

Metastases. Involvement of the regional lymph nodes represents a common feature. The literature states that metastases can be observed in other bones, subcutaneous tissues, lungs and brain. Occasionally it may be extremely difficult, if not impossible, to decide between the presence of a metastatic or a second primary lesion.

Diagnosis. Adequate diagnosis will depend upon careful correlation between the clinical, roentgenologic and histologic data. The main characteristics of the clinical picture were discussed previously.

Radiologically, several more or less typical findings have been postulated.[7,31,35,40,43] Roentgenograms, as a rule, show the tumor arising in the medullary cavity of the bone. The neoplasm tends to present itself as a predominantly destructive, osteolytic lesion. There may be cortical destruction of varying degree. The initial extension of the tumor is within the bone rather than into the soft tissues, and the involved bone has the tendency to develop a patchy and mottled appearance. Reactive proliferation of bone is frequently observed. A soft tissue mass, sometimes containing calcifications, may surround the bony lesion and often plain roentgenograms do not reflect the exact extent of the neoplastic process. These roentgenologic features, however, are not necessarily diagnostic. This last statement has been well illustrated by Fripp and Sissons,[11] and is also demonstrated by the multitude of diagnoses culled from the literature, which subsequently proved to be primary reticulum cell sarcoma of bone. Among such radiologic diagnoses were Ewing's sarcoma, Hodgkin's disease with bone involvement, osteogenic sarcoma, carcinomatous metastases, osteoid osteoma, eosinophilic granuloma, synovioma, angiosarcoma, malignant giant cell tumors,

metastatic neuroblastoma, Paget's disease of bone and other benign conditions such as chronic osteomyelitis, bursitis and even degenerative arthritis. The diagnosis, therefore, should be confirmed by additional studies and biopsy.

The use of intra-arterial injection of radiopaque material has been found to be of great value in the effort to differentiate benign from malignant lesions.[20] This was reported previously, and the observations made were found to be in agreement with the findings of other workers.[3,42] At the present time most patients with bone disorders of the extremities seen at Roswell Park Memorial Institute receive the benefit of arteriographic studies as part of their general work-up. There is no doubt in my mind that a well performed arteriogram, allowing adequate study of the arterial, capillary and venous phases of the circulation in the involved area, represents a most valuable addition to the present diagnostic armamentarium. One must realize, however, that it is impossible to establish an exact histologic diagnosis by angiography alone.

Peripheral arteriography is technically simple and innocuous if performed with precautions against idiosyncrasies to either the local anesthetic agent or the radiopaque substance to be injected. Routinely 0.09 gm. of barbiturates is administered by mouth and 75 to 100 mg. of demerol® are given intramuscularly approximately one hour prior to the procedure. Local anesthesia is entirely sufficient in most instances; general anesthesia should be reserved only for uncooperative children or for adults when mobilization of the affected extremity for the necessary correct position on the radiologic table would be much too painful. Once the percutaneous puncture of the proper artery has been performed, 2 or 3 cc. of 1 per cent novocain® are injected directly into the lumen of the artery in order to prevent vascular spasm. The advantage of an automatic seriograph is appreciable,[16,20] but not absolutely necessary. With this technical device it is possible to obtain films at regular intervals for better demonstration of the early and late arterial stages as well as of the capillary and venous phases, the demonstration of which was found to be so important in the detailed evaluation of vascular patterns. For all practical purposes, however, one film taken during the arterial phase and one during the venous phase should be sufficient to capture representative vascular alterations.

It must be emphasized that the needle should be inserted above the origin of the deep femoral artery, if a femoral arteriogram is taken. Only then is a complete visualization of the circulation of the whole thigh possible. The same is true for angiograms of the upper extremity where, for adequate demonstration of the circulation around the upper half of the humerus, the circumflex humeral artery should be filled. If vascular studies about the shoulder are desired, the branches of the first and second portion of the subclavian artery leading to this area should be rendered radiopaque. Arteriograms of the upper arm can be carried out by percutaneous puncture of the axillary artery. In obese persons, however, it may be of advantage to identify the axillary or brachial artery through a small cut-down high on the medial aspect of the arm. Once this has been accomplished, either direct puncture of the artery by means of a suitable needle or introduction of a small size catheter into the lumen of the vessel can be executed. A No. 17 spinal needle or polyethylene catheter of similar size are ideal for this purpose. Intra-arterial catheterization has the advantage that the exact level of injection can be chosen. This latter method is especially valuable for arteriograms about the shoulder joint, where it allows precise localization of the tip of the catheter directly at, or preferably 0.5 cm. distal to the origin of the representative branch of the subclavian artery to be injected. Possible complications arising from the inadvertent injection of the carotid or vertebral artery are herewith avoided and can further be prevented by digital pressure upon the carotid artery during the period of injection. In our own personal series of fifty-eight arteriograms performed at the Institute during the past year no untoward effects of any kind were observed either after direct percutaneous arteriography or intra-arterial catheterization. For obvious physiologic and anatomic reasons, arteriography of the extremities cannot be compared with cerebral angiography or aortography where the possible complications are concerned.

The vascular pattern of malignant neoplasms has, in general, typical features which are not observed under normal conditions or when dealing with benign tumors. The arteries are of irregular caliber, take a tortuous course and

often show an abnormal distribution. The capillaries within the tumor area are abundant and there is formation of puddles of dye of various dimensions. Arteriovenous fistulas may be seen at the level of the neoplasm. This is evidenced by the filling of the veins located proximally to the tumor during the arterial stage, therefore at a much earlier time than under normal circumstances, and with the veins distal to the neoplasm still remaining empty of radiopaque material. An additional but definite advantage of arteriography lies in the fact that angiographic studies in most instances outline the contours of soft tissue masses much better than is possible by conventional plain films. This more precise demonstration of the extent of soft tissue involvement also greatly aids in planning an adequate surgical approach, whether it is for a simple biopsy or definitive surgery. It must be realized, however, that this typical tumor pattern does not appear in all instances of malignancy. This is especially true for bone tumors which consist of notoriously poorly vascularized structures such as cartilage or dense fibrous tissue, or lesions which may still be confined to the subperiosteal space without penetration into the surrounding soft tissues. Injection of radiopaque material into a systemic artery renders visible the vascular tree leading to the soft tissues, while the circulation of bone itself has not as yet been demonstrated satisfactorily during the arterial phase. It may be somewhat different with the pattern visualized on films taken during the venous phase, in which occasionally there is evidence of retention of dye within an area which remained radiolucent and apparently surrounded by normal vessels during the arterial phase. The significance of this particular type of staining which has been observed in various tumors containing giant cells[20,34] is not as yet quite clear. Giant cells are thought to originate from the reticuloendothelial system. It, therefore, can be suspected that early lesions of primary reticulum cell sarcoma of bone which still are localized within the cortical boundaries of the bone could also show these staining characteristics during the venous phase. The demonstration of the circulation within the bone itself is to a certain degree satisfactorily achieved by means of intraosseous venography.[21,22,33]

The arteriographic pattern captured in the discussed case of primary reticulum cell sarcoma of bone does fulfill the aforementioned criteria of malignancy. (Figs. 4 and 5.) The over-all arteriographic picture does not vary greatly from the one observed in other malignant processes, except perhaps for the remarkable affinity of this type of neoplasm for the radiopaque substance used (urokon). This is evidenced by the diffusely pronounced staining and markedly prolonged retention of dye of an intensity rarely seen in other types of bone malignancies. Whether or not these features emanate as the result of the high concentration of reticuloendothelial elements within the tumor remains open for discussion.

Obviously, an adequate biopsy obtained either by aspiration or Silverman needle, and perferably by the open method, will allow detailed studies of the histologic architecture of the lesion and establish the exact diagnosis in doubtful cases.

Pathology. Grossly, the tumor usually appears as a pinkish white mass with a soft and friable consistency, as in our case. The neoplasm may contain areas of necrosis or can be firm, depending upon the amount of collagen present. The growing edges may be indistinct or form a pseudocapsule. In some instances involvement of the skin has been reported. The epiphysio-diaphysial junction most often represents the site of predilection, but seldom is there invasion of the joint capsule. New bone formation can be encountered, and the dimensions of the neoplastic process vary greatly depending upon the degree of proliferation after erosion of the bony cortex.

Microscopically, the characteristic cell type is the reticulum cell which does not differ from those found in reticulum cell sarcomas originating in other locations. These cells have the tendency to show amoeboid activity, as evidenced by the marked variation in their shape. The typical cell is larger than normal lymphocytes and contains within an eosino- or basophilic cytoplasm nuclei which are oval, round or kidney-shaped and larger than the nuclei of lymphocytes. The stroma is loose, with a variably dense collagen and a moderately vascular pattern. The lymphocytes encountered in the new growth are considered as tumorous elements by some authors who warn that inadequate biopsy material may be misinterpreted as "inflammation." From the histologic point of view, Ewing's sarcoma, small cell sarcoma, osteogenic sarcoma, metastatic carcinoma, multiple myeloma and certain benign

FIG. 4. Brachial arteriogram. Early arterial phase demonstrating clearly the displacement of the brachial artery and its branches by the tumors. There is marked vascular tortuosity and extensive new vessel formation in the affected area.

FIG. 5. Brachial arteriogram. Late venous phase illustrating the pronounced residual staining within the tumor. The extent of soft tissue involvement is clearly outlined. The veins proximal to the neoplasm are filled with radiopaque material which has to be supplied from the neoplastic area itself since the veins on the forearm are not visualized.

reticuloendothelial tumors have been listed in the literature as diagnoses liable to confuse the differential diagnostic picture.

Treatment. Definitive therapy should be undertaken only after establishment of the correct diagnosis. Radical excision, amputation, radiation therapy and administration of Coley's toxin represent the main therapeutic weapons presently available. Radiation therapy alone or surgery followed by irradiation of the regional lymph nodes are, at present, the most popular therapeutic approaches and appear to yield similar end results. Metastatic lesions seem best treated by irradiation. The total amount of irradiation should be in the vicinity of a tumor dose of 3,500 to 5,000 r, depending not only upon the tolerance of the patient but also upon the duration of treatment (i.e., the longer the treatment, the higher the total tumor dose).[25] The ultimate decision concerning the type of therapy to be employed will not only be dictated by the preference of the physician in charge but also be influenced, to some degree, by the local extent of the lesion and the existing symptoms.

End Results. As could be expected from a disease with a recognized long natural history, the survival rate tends to be a favorable one. The five-year survival rate has been reported as varying from 35.7 per cent[15] to 47.6 per cent,[6] while the ten-year survival rate in one series amounts to 38.4 per cent.[6] Metastases are known to occur as late as ten years after treatment of the primary lesion and, as men-

tioned previously, are successfully attacked by irradiation.

CONCLUSIONS

A case of primary reticulum cell sarcoma of bone has been presented. The available world literature pertinent to this topic has been reviewed and the clinical aspects of this entity as well as the radiologic and histopathologic criteria elaborated upon. A discussion emphasizing the various differential diagnostic features of the disease has been included.

Arteriography is discussed. The author believes that more frequent use of angiographic studies would result in a more accurate diagnosis of bone and soft tissue tumors. The typical tumor stain, as observed in the presented case of primary reticulum cell sarcoma of bone, has been illustrated by a series of roentgenograms demonstrating the arterial and venous phases. Arteriography can be performed easily and, if carried out properly, is followed by no untoward effects. No claim is made as to the replacement of biopsy by arteriography.

Primary reticulum cell sarcoma of bone is a neoplasm with a long natural history yielding, if accurately treated, rather favorable end results.

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We recommend:

Forceps Deliveries. By Edward H. Dennen, M.D., F.A.C.S., Professor of Obstetrics and Gynecology, New York Polyclinic Medical School and Hospital. A Series of Monographs edited by Claude E. Heaton, M.D., Associate Professor of Obstetrics and Gynecology, New York University College of Medicine, 228 pages, with 91 illustrations. Philadelphia, 1955. F. A. Davis Co. *Price* $6.50. (The author has described the various forceps, giving their indications, and has told and shown how to use them.)

Surgery for Nurses. By James Moroney, M.B., F.R.C.S. (Eng.). Foreword by Miss Dorothy M. Smith, O.B.E. Third edition, 696 pages, with 592 figures. Baltimore, 1955. Williams & Wilkins Co. *Price* $6.00.

Proper Handling of the Colostomy Patient

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ADVANCING surgical technics have increased the survival rates of cancer patients, but rehabilitation technics have lagged behind. As a result many patients leave the hospital without a definite knowledge of how to adjust to their new and strange handicap. The colostomy patient is in this group. He has lost the rectum, and is now faced with the extraordinary problem of establishing bowel control so that he will have no spillage at unexpected times. He can never be completely rehabilitated unless he can accomplish this. This is a real and definite problem and only one who has had a colostomy can know the great importance of this. One can never minimize this problem.

With proper handling and definite, clear instructions, the patient can return to a near normal way of living; he can maintain his job as before; he can continue his social contacts almost as well as before; and he can return to unbroken family relationships as before.

The colostomy patient usually leaves the hospital not only physically mutilated, but tremendously depressed, emotionally upset, confused and fearful. We know how he feels because one of us (S. M. S.) is a colostomy patient. She has been through this depression and agony. She has had to use the trial and error method for five long years. The climb upwards has been slow and painful, but she has finally arrived at the right answers. She has been able to enter the hospitals and to help other colostomy patients either directly or by a series of lectures to surgeons, internes and nurses. She has written a number of articles on colostomy rehabilitation. As a result of these articles, she has heard from surgeons, hospitals and patients all over the U. S. She has found a great similarity in the colostomy problems. We have gone over these problems together, and we have evaluated our findings. We have found that even though there are individual differences, there is a workable norm with deviations on either side to allow for individual differences.

Unless the rehabilitation of a patient is undertaken early, his problems of body management will become more and more difficult. Persistent depression, isolation, and invalidism may result far out of proportion to the problems at hand. The more quickly the patient can establish a living pattern similar to the one he had before, the more quickly can his rehabilitation be effected. Lack of knowledge will cause the patient to feel defeated; he will retreat, and will isolate himself from society. The surgeon can be the buffer between the patient and the necessary steps toward complete rehabilitation. Complete rehabilitation means freedom from spillage for a period of forty-eight hours between irrigations *without having to wear a bag*. The surgeon can use his skill and ability in rehabilitating the patient to feel as whole as possible. The patient has lost the rectum and part of his colon; he must now try to manage as adequately as possible with that part of the colon which is left. The patient is anxious to return to a life as near normal as before, to go back to work, to be a useful member of society and to maintain his social contacts. Usually he prefers his condition to be unknown to others. Often there are unpleasant reactions among those who are unacquainted with anything concerning the colostomy.

If considerable time passes, and the patient is still bewildered because of his lack of knowledge in handling the colostomy, he will become more and more depressed. He will finally be lost to society, and the possibility of his rehabilitation will become more and more remote.

The surgeon can become the means through whom the patient can reach the world of normalcy. The surgeon's work on the rehabilitation of the patient is as important at this point as the surgery that has been completed. He

must so plainly, clearly and concisely present the method of successfully handling the colostomy to the patient that there will be no hesitation in his using it.

New technics have to be learned, and the patient should not be led to believe he has no problems. The surgeon must face the problems directly with the patient and must help him to solve them step by step. He must be sympathetic and unhurried, as well as thoroughly acquainted with the facts the patient needs to know.

About the tenth day after surgery, or after the sutures are removed, the surgeon should bring another patient, who has successfully handled his handicap, to see the new patient. This meeting of patients is a source of great comfort and encouragement to the patient who is now faced with a new mode of living. While the patient is still in the hospital, detailed instructions on the handling of the colostomy should be given daily. These instructions should also be printed clearly and concisely, and should be given to the patient so that he may study the procedures until he knows them.

The patient must be told that by carefully following the irrigating procedure, he will be free from spillage for a period of forty-eight hours between irrigations. The irrigation equipment should be given to the patient on the same day he sees the rehabilitated patient.

The irrigating equipment consists of: 2 quart irrigating can, 24F catheter, 28 inches of rectal tubing, glass connector, metal clamp, irrigating cup with opening to admit a 24F catheter, rubber or plastic bags (disposable) open at the bottom, rubber or plastic bags (disposable) closed at the bottom.

Step by step this is the irrigating procedure: Prepare the materials for irrigation, then (1) Attach the rubber tubing (28 inches) to the irrigating can. (2) Close the metal clamp over the tubing.* (3) Attach the glass connector to the other end of the tubing.* (4) Connect the 24F catheter to the glass connector.* (5) Attach rubber or plastic sheath to the irrigating cup and let it hang into the toilet. (6) Hold the irrigating cup over the colostomy against the abdomen. (7) Pass the 24F catheter through the opening in the cup. (8) Hang the enamel can so that it hangs straight down and parallel with the patient.

* These may be left permanently connected.

The following is one of the most important features of the entire irrigation. The enamel can is held so that the bottom of it is approximately 4½ to 5 inches below shoulder level. The height will probably have to be experimented with to suit the patient, but the differences are not too great with each patient. Another way of judging the distance is to hold the can about 6 inches above the colostomy. Another way of measuring the accuracy of the level is to use a clock. It should take about ten to twelve minutes for ¾ to 1 quart of water to enter the colon.

A 24F catheter seems to be best for the average individual. This size is tried first. If a smaller size is tried, the patient may feel apprehensive about trying the larger size. It has been found that when a patient uses an 18F catheter, it is so narrow that there is a great possibility for much of the water to run out of the colostomy before it gets a chance to build up pressure, which is so necessary for proper emptying of the colon. Another important feature is the length of the catheter that must be inserted into the colon. Unless the catheter is inserted as far as it can go, there may be unsatisfactory emptying.

The low level of the can will cause the water to enter only the left colon which is what needs to be emptied. The object of the irrigating procedure is to build up pressure behind the fecal matter which collects in the left colon.

With S. M. S. as the subject, we tried some experimental x-rays. The roentgenologist introduced some barium into the left colon. X-rays indicated that with the irrigating can kept 6 inches above the colostomy, almost all the water collected into the left colon. A very slight amount, which may be considered negligible, rose into the transverse colon. This small amount, caused by peristaltic action, was too slight to be troublesome and simply was absorbed. We found that an irrigating can held 18 to 24 inches above the colostomy would usually cause the water to rise above the left colon and enter into the transverse colon. After the water entered the colon at this height, it would get lost there, and not come back during the irrigation. The patient would feel cramps and get water-logged. Then, in the normal process of peristalsis, the water would return in spurts any time from twelve to twenty hours later. The patient would then think he had

diarrhea, and would take the wrong steps to correct the condition.

During the first few irrigations, the patient is not only apprehensive, but he is generally in pain. If this is the case, it is advisable to give the patient an injection of 50 mg. of demerol about fifteen minutes before the irrigation. In this way, the patient will become conditioned not to fear the irrigation and its accompanying discomfort and pain. This can be continued for the first five or six irrigations. The amount of demerol can be reduced to 25 mg. and by the time the patient is ready to go home, he is on his own, and without the use of further demerol.

The two quart irrigating can is filled with tepid water (slightly warm to the hand). No solution is used. The patient sits on the toilet. The metal clamp is closed. The 24F catheter is slid through the opening in the plastic cup that fits over the colostomy. The catheter may be lubricated with either KY lubricating jelly or desitin. A plastic or rubber sheath about 12 to 14 inches long and about 2 inches wide fits over the neck of the irrigating cup and goes into the toilet bowl. It is attached to the cup by means of a rubber band, or if made of rubber, fits directly over the neck of the cup.

The metal clamp is opened before the catheter is inserted into the colostomy. This prevents air from entering the colostomy. If it does, the patient may become airbound, and there may be difficulty with the irrigation. The patient usually likes to use a lubricant on the catheter. Actually, the water running from the catheter serves as a lubricant. As the water is running from the catheter, the patient inserts the catheter *all the way into the colostomy*. Experimental x-rays showed that the catheter will not enter the transverse colon if this is done. The tip is usually about 2 inches away from the splenic flecture. If the colon is short the catheter will generally curl up in the left colon. About three years ago S. M. S. had to have about 8 more inches of colon removed. The insertion of the catheter, even in this case, did not cause it to enter the transverse colon. The detail of inserting the catheter all the way in is very important. Some doctors are afraid of perforating the colon if the catheter is inserted all the way in. However, perforation can occur at the first inch of the colon if one is not careful with the insertion of the catheter. That is why the patient should insert the catheter himself. He generally can feel where it is going. He is always told to insert the catheter gently. The patient can usually feel it if the catheter hits the intestinal wall. The patient must be told to insert the catheter with a slight upward motion, since the lower part of the colon is gone.

After ten to twelve minutes, about ¾ to 1 quart of water has entered the colon. If any water spills out at the sides of the catheter, this is not considered as part of the water going into the colon. This is why the entire 2 quart irrigating can is filled, to allow for the possible loss of water. Usually when a 24F catheter is used, the colon wall will hug this size sufficiently so that very little water will be lost as it goes into the colostomy.

At times the patient might find it difficult to insert the catheter into the colon because it may be clogged at the entrance. If this is the case, the patient will have to remove the catheter a few times and clean it, in order to get the water running into the colon. A clogged colon is a sign of constipation, and the patient should be taught to avoid this condition. Most medical authorities have taught their patients to be constipated, but we have found this condition is not only to be feared by the patient, but to be avoided at all times. This condition will be discussed later.

After the ten to twelve minute period of water inflow, the patient removes the catheter. The opening in the irrigating cup may be closed with kleenex or toilet tissue, or a cork covered with wax paper, or adhesive may be placed over the opening.

The patient watches the clock again. It should take another thirty-five to forty minutes for the colon to be emptied. The patient gets a cramp, a spurt of liquid, a movement, and then a rest. Sometimes the rest may be as long as five or ten minutes. But in the overall picture, the colon will empty itself in the thirty-five to forty minute period. Sometimes the patient may exert constant pressure about an inch above the colostomy to induce peristalsis.

Some patients drink a glass of ice water immediately after the water is in the colon. This tends to speed up peristaltic action in many cases. The patient can be told to try it.

The patient should be told to try this irrigating procedure every forty-eight hours. He should also be told that he may be free from spillage for only twenty-four hours in the beginning and to expect possible movements on the second day. Some patients are able to go

on the forty-eight hour schedule from the very beginning, but some are not. However, we do not believe it advisable to start the patient on the twenty-four hour schedule during the first few days as the irrigating procedure is very fatiguing for a patient, especially since he has already been through the ordeal of extensive surgery. The colon will gradually become accustomed to being emptied once in forty-eight hours by means of the irrigation. There will be no spillage in between, provided the patient learns to maintain a balance between constipation and diarrhea. This balance, that must be maintained by the patient, is just as important as the irrigating procedure.

After the irrigation, the patient washes the equipment with soap and warm water. It can be dried with toilet tissue, and then stored in an airy place. A step-on garbage can with the lid left partly open for circulation of air may be used for this purpose.

The next step is the bath. Warm water and soap can be used to clean the colostomy. A warm bath is always relaxing for the patient. Very often the muscles around the colostomy stiffen during the irrigation, but they relax after a warm bath. After the bath, the patient should attach the irrigating cup to the plastic or rubber collection bag. He can wear this under a supporter for a period of twenty minutes *only* after the irrigation. If there is any water left in the colon, it will come out at this time.

Constipation. Most physicians believe a colostomy patient should be constipated. This condition is to be feared by every colostomy patient. It may take days to get rid of this condition. If the patient is constipated, he may have a feeling of fullness or pressure, he may have gas, or worse still, he may have constant seepage of liquid around the fecal matter. This liquid oozes from the colostomy and makes the patient very uncomfortable and apprehensive. The oozing of liquid may cause a patient to think he has diarrhea, and he may take the wrong steps to stop it. The patient may get small movements during the forty-eight hour period after this constipated condition. The water sent into the colon during the previous irrigation may remain in the colon, because insufficient pressure has made it impossible for the colon to be emptied. The fecal matter, if hard, serves as a block for the water. Unless the left colon is completely emptied at the time of the irrigation, the patient may expect trouble during the next forty-eight hour period. Some patients exhaust themselves trying to do the irrigation over again, but this is to be avoided. If the colon is quiescent, it will act in the same manner when it is tried again. Each patient will have to find his own balance between constipation and diarrhea by careful, patient and persistent experimentation. In order to avoid constipation, the patient should eat some kind of fruit (raw or cooked) or raw vegetable at least twice a day. About twelve hours before the irrigation the patient should take some fruit. If constipation persists, the patient should take a mild laxative.

Diarrhea. Some possible causes of diarrhea may be diet, emotional stress, fatigue or sudden diet changes.

What to do: If the liquid in the lowest 2 inches of colon can be absorbed, peristalsis will stop for a few hours. In order to do this, the patient may take a piece of kleenex and twist the center of it, so that it protrudes stiffly for about 2 inches. This may be inserted into the colostomy. When the kleenex gets wet, the patient may change it for a dry one. This method will usually stop peristalsis until it is time for the next irrigation.

If diarrhea persists, usually a few drops of deodorized tincture of opium, (anywhere from 5 to 10 drops) will stop activity of the colon within an hour. This may be repeated with caution in four hours. The danger here is that the patient may become so constipated that he may have great difficulty the next time he irrigates.

The patient should be told not to eat too many raw fruits at odd times. He should avoid spices, iced drinks, alcohol, carbonated drinks, rich gravies or too many mixtures.

Drugs. If the patient has a virus, or has been given one of the "mycin" drugs, he may expect to have diarrhea. No amount of opium will stop this form of diarrhea. If a "mycin" drug is used, the patient should be told what to expect—that he may have diarrhea for several days. However, in ordinary cases of diarrhea, 5 to 10 drops of opium will be sufficient, depending upon the individual.

On the other hand, if it is necessary to give a patient codein, he should be told that his colon will not function properly either. The use of codein will paralyze the colon, and irrigations at this time will not only cause the

patient to retain water, but will make it impossible for him to empty the colon until the effect of the drug wears off.

No Irrigations. Some doctors maintain that a patient may possibly be regulated and have movements at regular times without the means of the irrigation. S. M. S., personally, has tried this, and so have many of our patients. So far, we have never found a case in which this could be accomplished. That part of the colon must be emptied which takes fecal matter forty-eight hours to collect.

Gas. Most patients have a great deal of gas during the first three months after surgery, but this tends to lessen after this time. To avoid gas, the physician may give the patient 3 minims of kerol daily before breakfast. A carbisol capsule may be tried a half hour before the meal. The patient should be told to avoid eating gas-forming foods such as onions, kale, cabbage, baked beans, broccoli and nuts. If the patient thoroughly cleans the left colon, he generally will be free of gas. If the patient is constipated, gas will generally be present.

Diet. The patient should start off on a low residue diet immediately after surgery, but after the irrigations are begun, the patient should follow a regular diet as soon as possible. Meals should be eaten at regular hours. It is advisable to eat a light breakfast, a light lunch, and a regular dinner. It is advisable for a patient who is working to irrigate at night. In this way, if the patient has any irrigating troubles or if he is fatigued, he will have the night ahead of him in which to rest and relax.

The patient should try one new food every two days. If he can tolerate it and has no spillage, then this food may be added to his diet. After about two months, the patient should be able to go on a non-constipating diet such as the following:

Breakfast

Fruit (prunes, apple sauce, grapefruit, apricots)
or
Fruit juice (grapefruit, orange, prune)
Cereal or egg
Bacon, well done, if desired
Toast and butter
Coffee

Lunch

Raw vegetable or fruit salad
Cottage cheese
Tea and cookies

Dinner

Meat or chicken
Potato
Vegetable (if constipated, spinach or beets)
Jello or pudding
Coffee (cake, if desired)

It is advisable to tell the patient to irrigate *after* a meal (after breakfast, if one is free and if this time is preferable, or after dinner, if one is working).

Dressing. After the colostomy narrows down to normal and gets dry, the patient may wear only a kleenex or toilet tissue over the colostomy. He may prefer to wear a 4 by 4 gauze dressing, or a 4 by 6 zobec® pad. The kleenex is inexpensive, disposable, absorbent. A drop of albolene on the dressing will prevent sticking. Over the kleenex or gauze the patient may wear a piece of folded wax paper large enough to line an athletic support about eight inches wide. This support should fit snugly, but not tightly around the body. It should be made of light weight, mesh and elastic material. The bottom of the support may be used to hold the rear dressing in place immediately after surgery. Later on, when this part is not needed, it may be cut off. The wax paper will prevent seepage of moisture from mucus, is disposable, and inexpensive. The same kind of dressing may be worn at night.

If the mucosal surface oozes blood, a 50 per cent solution of alcohol may be tried. In case of skin irritation around the colostomy, vaseline gauze, or desitin or 10 per cent zinc oxide over the stoma and under the dressing would be effective. If the skin is granulated, silver nitrate will help.

Dilation. The patient should be taught to insert daily a gloved finger covered with KY lubricating jelly or desitin, to prevent possible stricture of the stoma at skin level. Persistent stricture of the stoma may necessitate periodic dilation by the surgeon. Too great stricture may indicate the need for revision, and may be the cause of poor colostomy management.

Accidents. Usually a patient gets frantic in case of an accident or spillage. Incorrect irrigating methods, and sometimes emotional stress, are the cause. The patient should first try a kleenex twist. If this is not successful, he may try 5 to 10 drops of opium, provided it is not more than five or six hours after the last irrigation. The nearer the time for the next

irrigation, the less advisable to take the opium, as this may interfere with proper emptying during the next irrigation. On this point the patient should be taught to use his common sense. If diarrhea does not stop, it may be best to irrigate an hour earlier than usual and then take the opium immediately after the irrigation. It should be remembered that diarrhea will not stop if the patient has this because of a virus.

Attitudes. The surgeon should not only be sympathetic and understanding toward the patient, but also should present all the facts that would help rehabilitate him. He must be unhurried. He must be very firm about not allowing the patient to wear a bag. The patient will probably beg for this in his bewildered state; but if the surgeon acquiesces, the patient will inwardly sink to a new low. The patient longs to be told how he may carry on without a bag. If use of the bag is permitted, the patient will feel a sense of doom and failure. There may be trying days in the beginning; but when the patient begins to see that all the facts presented to him by the surgeon are true, he will begin to be more hopeful. His outlook and emotional state will begin to improve. The surgeon should take it for granted that the patient will go back to work as before. As a matter of fact, he should urge the patient to return to work as soon as possible (perhaps after a period of two months after surgery). Here again the patient may try to blame his colostomy for not returning to work. He may think he is disabled so that he cannot work as before. The surgeon should, in this case, kindly, but firmly, press the patient to resume his job. This may be a little difficult, but it is one of the most important steps toward the rehabilitation of the patient.

Written Instructions. Detailed, clear and concise instructions should be given to the patient both verbally and in printed form. Instructions may also be given while a member of the family is present. In this way, what the patient may not have absorbed in his confused state may be remembered by the member of the family. At the same time, the patient's family will have some understanding of the problems involved in having a colostomy and may tend to be more sympathetic toward the patient. It is important for the patient to be treated as before by his family, and to be helped wherever possible.

Rules for the Patient. Some of the important rules to tell a patient are as follows:

1. Learn to manage your colostomy so that you are its master. Do not let it rule your life.
2. Do not talk about your colostomy.
3. Do not avoid work. Go back to work as soon as possible.
4. Avoid fatigue.
5. Keep up social contacts as before. No one need know you have a colostomy, if you follow this irrigating method.
6. A relaxed individual will have a relaxed colon. If your colon is relaxed, it will respond properly to the irrigations, and you will feel better for two days after a successful irrigation, i.e., no spillage for forty-eight hours between irrigations.
7. After the irrigation, a warm bath will help to relax the muscles around the colostomy.
8. If you have any trouble, check back to find what possible error you may have made during the past forty-eight hours.
9. You will generally be able to follow a diet similar to the one before the operation, except now you may have to eat less constipating foods.
10. Rest for about an hour after the irrigation.
11. A colostomy belt or dome will be a badge of failure. It will distort your figure; it will become odorous; it may cause hernia; it is not clean.
12. If your colon does not act properly during the irrigation, do not try to irrigate over again, but try for better results the next time.

Abnormal Conditions. So far, we have discussed normal conditions of the colon under ordinary circumstances. But there are some abnormalities that every colostomy patient will have to face at some time or other. He will have to learn the best ways of handling these problems.

Sluggish colon—hard fecal matter: Symptoms: Patient has no sensation. The colon is quiescent. The patient is apprehensive. He will fear obstruction. He will retain water during the irrigation. He will not respond properly to the irrigation during these times. What to do: Laxative indicated every twenty-four hours. The patient should increase his fruit intake. The patient should be told that this condition

may take several days to straighten out. He may take milk of magnesia, alophen, cascara.

Sluggish colon—soft fecal matter: Symptoms: Patient gets slow seepage. The skin around the colostomy may become irritated. Water will remain in the colon. Irrigations will be unsuccessful. What to do: Kleenex twist may help. Increase fruit intake. Laxative may help.

Active colon—hard fecal matter: Symptoms: Most uncomfortable for the patient. Seepage in the form of heavy mucus acts as lubricant. This often causes the patient to think he has diarrhea. Patient gets periodic hard movements every hour or so. What to do: Laxative every twenty-four hours. Irrigate every twenty-four hours.

Active colon—soft fecal matter: Symptoms: Diarrhea and cramps. What to do: 5 to 10 drops of deodorized tincture of opium immediately after the irrigation, or within five or six hours after the irrigation. If this occurs at a time nearer to the next irrigation, the patient may irrigate a little earlier and then take the opium.

SUMMARY

Too many colostomy patients who are discharged only receive instructions to wear a bag; or they are told they must irrigate the colostomy to eliminate the need of a bag. These instructions are so vague that the patient becomes frantic with worry, fear and uncertainty. These "instructions" do not help the patient. He must be told accurately, specifically, and definitely what he can expect and what he is to do in order to keep himself free from spillage for a period of forty-eight hours between irrigations without the use of a bag.

The surgeon must not only allay anxiety on the part of the patient, but he should in a friendly manner assume the responsibility of rehabilitating the patient after the operation. He can encourage, dispel fears, restore function, and prevent lessening of economic activity.

Instructions may need to be repeated often. Printed instructions will help a great deal. The surgeon has been effective in saving the life of the patient; he can now be equally as effective in rehabilitating the patient.

Pharmacology and Therapeutic Application of Agents or Drugs Used in Functional Disorders of the Colon

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RECENT advances in therapeutics and pharmacology justify a review of the possible applications of the new drugs that have been formulated to the treatment of functional disorders of the colon. In addition, iatrogenic disturbances of colon function may be produced as unwanted side effects in the management of disease outside the bowel. A consideration of these and other factors will be made.

In discussing the therapy of functional diseases of the colon one must consider the abnormalities associated with such dysfunction. Altered function without primary organic disease may be manifested by a disturbance in motor function or secretory activity, or a combination of both. Disturbances in motor function may be associated with pain due to muscle spasm accompanied by constipation or diarrhea, or both. Disturbance in secretory function is usually manifested by some alteration in mucous secretion. The prevalent complaint or presenting symptoms ascribed to the aforementioned dysfunction is usually an alteration in bowel habits characterized by constipation or diarrhea, or both. Constipation is a disturbance of great significance to the proctologist since the hard stool may be the cause for organic disease or complaints which bring the patient to him.

In considering the abnormalities of constipation, one must be cognizant of the fact that constipation may be due in part to central or peripheral manifestations of abnormalities of the central nervous system. Regularity of bowel habits and adequate fluid intake is of paramount importance in regulating and inducing normal bowel hygiene, and need not be discussed here. Drug therapy for constipation due to motor dysfunction may revolve around the use of antispasmodics or spasmodic agents, depending upon the underlying cause. Such action may be facilitated by the use of synthetic or natural bulk-inducing agents. This latter group of compounds includes the saline drugs which cause bulky stools not by any primary action of the drug upon the colon itself, but by virtue of the ability of the saline cathartics to hasten the passage of the ingested food through the small intestine so that a greater and more fluid bulk is presented to the large colon.[1] The increased volume of material presented to the large bowel stimulates it so that purgation results. The mechanism of action of the saline cathartics is based primarily on the fact that they contain ions, anions or cations that are slowly absorbed from the intestinal tract. By virtue of their osmotic action, they promote an increased uptake of water by the small intestine and thereby increase its fluid bulk. Since these ions are not completely innocuous, one word of warning should be considered. Occasionally sufficient levels of the ions may be absorbed to such an extent that undesirable toxic effects may result. Thus, if magnesium sulfate is used as the cathartic, excessive absorption of the magnesium cation may result in depression of the central nervous system due to pharmacologic properties of magnesium. While evidence of systemic toxicity is rarely seen, one can anticipate symptoms of magnesium poisoning if there is prolonged retention of material in the intestinal

tract or if renal failure prevents adequate excretion of the cation.

Of greater importance both therapeutically and clinically are the bulk laxatives consisting primarily of the hydrophilic colloids and indigestible fiber groups.[2] The methylcellulose group and psyllium seed are the most effective of these compounds. Both are efficient absorbers of water, methylcellulose having the ability to take up about ten times the weight of the administered drug while the psyllium seed will absorb twelve times the weight of material. The use of these bulk laxatives does not cause incipient irritation. Methylcellulose or psyllium seed preparations, or both, are the most innocuous of all the cathartic drugs.

There are, nevertheless, some bulk-inducing laxatives that are not entirely desirable. Some mention should be made of two naturally occurring bulk-inducing hydrophilic colloids, bran and prunes. Bran, obtained from the milling of wheat, contains about 20 per cent indigestible cellulose. It has no discernible effect upon gastrointestinal motility. However, in some individuals, excessively large doses may cause irritation of the intestinal mucosa so that spasticity results. In addition, it has been claimed by some that since bran may become hard, dry and packed, of all the "bulk laxatives" it is most prone to induce fecal impaction. Fecal impaction may result, not only because of the spasticity it induces by virtue of intestinal irritation but also by the formation of hard, dry, packed stool.

The other naturally occurring bulk food laxative is prunes. The cathartic action of prunes is due in part to the hydrophilic action of certain components present in the fruit. Prunes also contain a mucilaginous material and mild irritants that aid in reducing constipation.

One common word of caution in the use of any of the bulk laxatives is that application in the less active elderly patient may result in packing of the stool and blockage of the large bowel so that intestinal obstruction could result. Hence, it is mandatory in these individuals to encourage adequate fluid intake with the hydrophilic material to prevent this untoward effect.

Constipation may result from the use of one of two types of compounds used in the treatment of cardiovascular disease or disturbance of the gastrointestinal tract other than the colon. These constipating iatrogenic agents are the hexamethonium ganglionic blocking drugs and the anticholinergic drugs in general.

The ganglionic blocking agents (such as hexamethonium and pentolinium) are employed primarily in the therapy of hypertension. Their use may lead to constipation, eventually ending in fecal impaction, in the unsuspecting or ill advised patient. Here, obviously, a diet consisting of an increased proportion of roughage may be advisable, together with the use of agents tending to enhance the bulkage content of the stool and drugs to promote intestinal motility. Two such drugs have been recommended to overcome the undesirable effect of the ganglionic blocking agent in addition to the use of the hydrophilic preparations outlined previously. One preparation, which has also been used in the treatment of hypertension, that has proved to be invaluable in counteracting the constipating effect of the ganglionic blocking agent is reserpine, the purified alkaloid originally obtained from the Indian plant Rauwolfia serpentina. This alkaloid has the potential action of increasing intestinal motility and secretion. The effect upon motility may be diminished to a certain extent by atropine. However, it has nevertheless been demonstrated that reserpine may have a direct effect upon the muscle fiber itself so that not all of the action in increasing intestinal activity is based upon its cholinergic qualities. The anticonstipating effect of reserpine (0.1 to 0.25 mg. three times a day) is a valuable adjunct to the therapeutic armamentarium of the physician in counteracting the constipation noted after the use of hexa- and pentamethonium compounds. The combination of reserpine with the ganglionic blocking agents will not only diminish the constipating qualities of the latter but also will enhance their hypotensive propensities.

Cholinergic compounds such as prostigmine® methylbromide (15 mg. three times a day) have also been used to counteract the untoward effect of the ganglionic blocking agents. While the prostigmine derivatives will correct, to a certain extent, the constipating effect of the hypertensive drugs upon the large bowel, they will also induce certain undesirable side effects due to the vagotonic action of the prostigmine group of compounds. For example, the cholinergic activity of prostigmine would be highly

deplored in the management of constipation in patients who also have peptic ulcer. In addition, the parasympathomimetic-like activity of prostigmine may cause intestinal cramps and pain due to the increased muscular activity. Its effect upon the hypertensive state is also one of question and may induce certain cardiac arrhythmias in the susceptible patient.

Regulation of the lower bowel may also be achieved by drugs that act primarily upon the central nervous system.[3] The time-honored use of the barbiturates in correcting some of the underlying functional disturbances of the bowel characterized by defects of motor or secretory function is well known. The property of the barbiturates to act centrally and synergize the antispasmodic or antisecretory activity of certain drugs has been widely used. Hence, barbiturates have been combined empirically with a wide variety of drugs. While their value in such combinations may be debatable, it is believed that by virtue of the central depressing effect of the barbiturates, enhancement of the desirable pharmacologic properties of the added drug will result. Other centrally active drugs have also been put to use and may be employed with some degree of expected therapeutic success. One such preparation already mentioned is reserpine; another is chlorpromazine. Both drugs have effect upon the central nervous system and can lower body temperature by virtue of their effect upon the hypothalamus.[4–6] Chlorpromazine has the potentiality of prolonging the action of many central nervous system depressants. It will also accentuate the pain-controlling qualities of many different analgesic compounds.[7,8] Its value in tension states had been demonstrated and thereby would be of advantage in disease of the lower bowel. Among its side effects are sedation without hypnosis, dryness of the mouth and nasal congestion. It has been known to cause jaundice and liver disturbances comparable to bile duct obstruction. Jaundice will usually subside after the drug has been discontinued. Reserpine is another central nervous system depressant, possessing properties comparable and supplementary to those noted for chlorpromazine. Both drugs have a tendency to be synergistic in their action and may be used to produce a central nervous system depressive action usually desired or attributed to the barbiturates. Some undesirable side effects ascribed to reserpine have included the following: nasal congestion, sedation, increased frequency of bowel movements, unpleasant dreams and, rarely, a parkinsonian-like syndrome. The nasal congestion is recalcitrant to antihistamine therapy. The role of chlorpromazine and reserpine in the therapy of disturbances of the lower colon may be one of increasing importance when the physician is concerned with altering large bowel function by considering drugs that are active in suppressing the central nervous system. Other non-barbiturate sedatives recently made available include glutethimide (doriden®) which has proved to be of value in diminishing anxiety or tension states. Since these clinical entities in turn could have an adverse effect upon bowel function, the apparent value of glutethimide and other sedatives in controlling these induced disturbances in bowel function by inhibiting the adverse central stimuli would be of significance.

The proctologist should be aware of the effects of anticholinergic compounds upon lower bowel function. The search for compounds with the desirable belladonna-like activity in certain respects and elimination of the antisecretory actions and undesirable atropine-like properties on the other hand has culminated in the prototype and initial anticholinergic drug being formulated, methantheline bromide (banthīne®). A long list of proprietary preparations being made available followed. They possessed belladonna-like activity and were designated as the anticholinergic group of compounds. Despite these developments, there are those who believe that none of the newer anticholinergic compounds possess a superior advantage over the belladonna group of drugs with respect to depression of intestinal motility. Since functional disorders of the colon may be associated with conditions descriptively labelled as the irritable or spastic colon, or spastic constipation and/or diarrhea, the use of an antispasmodic compound would tend to a great extent to allay such conditions. Adequate control of these adverse functional or even psychogenic disturbances of colon function may be achieved by the judicious use of the anticholinergic group of compounds. This group includes methantheline bromide (banthīne®), propantheline bromide, (pro-banthīne®) diphenmethenil methyl sulfate (prantal®), oxyphenonium (antrenyl®), scopolamine methylbromide (pamine®) and homatropine

methylbromide (mesopin, novatropin). Many of these compounds still tend to produce the xerostomia, diplopia and the like that could be anticipated from the belladonna group of alkaloids. It has been claimed by some investigators that several of the anticholinergic compounds may have more pronounced effect upon the colon than upon the rest of the gastrointestinal tract. While there is no uniformity of opinion, the levorotatory alkaloids of belladonna and dicyclomine appear to have a greater effect upon colon spasticity than the other preparations tested.[9,10] The use of these agents in decreasing colonic spasm may result in relaxation of tonic segmental contraction of the colon and thereby have an ameliorating effect upon constipation. The increased segmental toxicity would be prone to inhibit propulsion of the stool and delay its passage through the colon.[11] In so doing dehydration occurs and constipation may result. The use of the anticholinergic compounds may diminish this untoward effect primarily by its ability to decrease segmental toxicity and thereby correct the underlying factors predisposing to constipation.

On the other hand, one must also be aware of the fact that the use of the anticholinergic compounds in the treatment of peptic ulcer may induce constipation. This undesirable side effect following peptic ulcer therapy may result in atonia of the bowel due to inhibition of both segmental and propulsive contractions. As a result, stasis of bowel content occurs in much the same manner as noted in the spastic colon. Dehydration of the stool eventually results in constipation. Thus, knowledge of the effect of these compounds upon bowel motility is important in understanding the basic disturbances that may ensue.

The last portion of this discussion will be devoted to the role of pituitary adrenal corticotrophin hormone (ACTH) and cortisone in proctology. In considering the effect of these hormones as being one and the same, i.e., that the effect of these agents is either due to the endogenous induction of secretion of cortisone by ACTH or its exogenous administration through ingestion of one or another of the corticoids, the use of these drugs may have several important therapeutic implications to proctologists. The antiphlogistic effect of the corticoids may be of some value in ulcerative colitis, particularly in the acute phase of the disease. In addition, it has been stated that cortisone may inhibit the hypersensitivity of mesenchymal tissue, thereby accounting in part for reduction of the intense inflammatory bowel changes seen in patients with ulcerative colitis.[12,13] Other benefits in this condition attributed to the corticoids might be the alteration in the enzyme systems, tissue permeability and mechanisms involving hyaluronidase activity. The possible mechanisms of action of cortisone directly or ACTH indirectly is all speculative and cannot be definitely proved. Other benefits due to corticoid therapy in the acute disease may be based in part upon the improvement in general outlook and appetite. These factors appear to be of immeasurable value in cases of short duration with relatively limited changes in the colon, but with severe systemic effects.[12,13]

Other therapeutic potentialities of the corticoids has been in the topical application in some cases of intractable pruritus ani. Application of concentrations of 2.5 per cent hydrocortisone creams or salves or those containing 0.25 per cent 9-α-fluorohydrocortisone to the target area may be exceedingly effective in controlling much of the discomfort noted in these patients at this time.[14] The primary effect of the steroid in these conditions is to suppress the pruritus. This affords the clinician the opportunity to detect and attempt to treat the underlying disease adequately. The advantage of topical medication in such conditions is that generalized systemic effects are avoided. The beneficial therapeutic effect of the corticoids are achieved without the concomitant disadvantage of systemic alteration of the patient's endocrine homeostasis with the resultant aftermath. The *modus operandi* of topical cortisone is obscure and the benefit that is achieved must not be considered as evidence that the corticoid is a cure for the underlying or precipitating conditions. Topical hydrocortisone therapy will be of little avail in patients with pruritis ani secondary to anal fistulas, fissures or extruding hemorrhoids.

In contrast to the previously mentioned benefit, one must be aware of the fact that ACTH and the corticoids may induce injurious or harmful changes due to the inherent effect of the corticoids in excessive dosage in inhibiting reparative processes.[12,15] The possibility that cortisone may induce giant ulceration and perforation of the upper and lower gastro-

intestinal tract is ever present and is a dangerous one. It is impossible to predict when such accidents will occur.[15] However, when they do take place, prompt diagnosis is mandatory to prevent serious complications.

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A New Injection Treatment for Hernia

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THE problem of hernia has been present probably ever since the first case of descent of a testicle into the scrotum leaving a weakened area in the transversalis fascia. Hernias are common; their incidence in men is estimated at from 1 to 5 per cent,[1] and the disability they cause is considerable. From this point of view, hernia is one of our major surgical problems.

Much time has been spent in trying to ascertain what percentage of hernias begin as a preformed sac. Probably the truth is that different types of hernias vary in this regard. In Arabia most hernias begin as small bubonoceles, and nothing would seem to be gained by assuming a preformed sac in each case. With or without a preformed sac, the inguinal region of the transversalis fascia is weak because the descent of the testicle has left it so. In a certain number of cases this weakened fascia proves inadequate, which means simply that the intra-abdominal pressure pouches it into a sac and thus a hernia is formed.

A developing hernia is a problem in physiology. The fascial sac investing the abdominal cavity is elastic, and normally the intra-abdominal pressure is offset by the elasticity of the collagen fibers. Man's erect posture makes the strain greatest in the inguinal region. The weakened area is usually small and sharply defined.[2] When its fibers are over stretched, some of them rupture. Later episodes of pressure cause further rupture and a hernia begins to develop. No doubt there is a certain capacity for repair in fascia, but the process is slow and weak; and when a hernia is once started, it goes on to develop considerably.

However, as far as surgery is concerned, the hernia is a problem in anatomy. The thin strong transversalis fascia is stretched over certain unsupported areas, the largest of which is the hiatus between Poupart's ligament below, the internal oblique above, and the conjoined tendon medially. The strain to which the fascia is exposed increases rapidly with the increase in size of such a gap. Doubling the diameter of the hiatus increases the strain by a factor of four. Failure of the transversalis fascia over a very small area initiates the process; but when the patient comes to the surgeon, complications have arisen. The hernia pushing aside the surrounding structures has enlarged the hiatus between them, sometimes to startling dimensions. I have seen such openings 1 inch in each diameter.

However large or small the opening is, the surgeon's task is to close it. He has the choice of two possibilities. By rearranging the muscular and fascial components of the abdominal wall he can reduce the size of the opening. Bassini did this by approximating the conjoined tendon to Poupart's ligament. His work was a milestone in modern surgery. No end of variations in the details of this operation have been introduced and abandoned, and after fifty years' experience it appears that by means of this reduction in the size of the abdominal ring we may expect approximately 90 per cent permanent cures and 10 per cent recurrences. The discrepancy in the figures reported by different men probably results from the difference in the size of the apertures and in the quality of abdominal tissues among a variety of patients.

The second possibility is that the transversalis fascia may be strengthened, even to the point of supporting the intra-abdominal pressure over a 1-inch hiatus. We have recognized for a long time that a direct hernia is best repaired by means of an autogenous fascial patch. This is because of the poorly organized transversalis fascia in the hernia and also because of weak surrounding tissues. The indirect inguinal hernia has not been treated in this way except under unusual circumstances.

Recently, however, an effort has been made

to treat indirect hernias in this way. The reason is obvious: Although Bassini's operation is simple and effective, it seems adequate only for bubonoceles and hernias up to the size of a pigeon's egg. In such hernias, between the internal and external rings there is an oblique canal perhaps 2 cm. long, with a fairly adequate floor. Recurrences should not run over 5 per cent if the repair is well done. As hernias grow larger, however, the internal and external rings become superimposed. The oblique canal and its floor disappear. Bassini's operation is very unsatisfactory then, and there have been many efforts to improve it. Some suitable patch is needed to reinforce the transversalis fascia, reinforce it indeed to a point far above its normal strength, for it must carry the intra-abdominal pressure across an abnormally large hiatus between the muscles.

Koontz[3] started the investigation of this possibility in 1927 with the use of preserved ox fascia which is soft and supple and enormously strong. Chandy[4] later showed that the ox fascia is replaced within three or four years by cellular ingrowth from the tissues of the host. Apparently the replacement fascia is just as strong as the ox fascia transplant.

Patches of cutis have been similarly used with good results.[5,6] Like ox fascia, these transplants are replaced by the tissues of the host eventually. Lately tantalum® mesh has been widely used, since this substance has been found to induce the formation of a very satisfactory and strong fascial sheet. Even though some of the constituent wires of the mesh eventually fracture from much bending,[7] the efficiency of the repair is unaffected because its strength depends upon the fascial sheet which has been produced. The great disadvantage of the tantalum patch is its harsh rigidity. It is suitable for large ventral hernias but can hardly be used for ordinary indirect hernias except by sacrificing the cord, a procedure which is justified only in extreme cases. On the other hand, the cutis graft and the ox fascia graft are soft and pliable and can readily be used as a routine reinforcement in any hernial repair.

We have come to realize that the effectiveness of all these patch technics depends upon the host's production of an autogenous fascial sheet. The question naturally arises whether there may not be an easier and better way to accomplish this. Substances that induce fibrosis can be injected, and fibrous tissue laid down, almost anywhere we wish. Efforts to cure hernias in this way date back far into the past. Historians assure us that in 1665 Nicholas Lequin treated hernias in such a way, and no doubt with some success.[1] Approximately twenty years ago there was an active revival of this effort in the United States. Bertrud[8] and Fowler[9] were two of the leaders in this effort. It was found possible to cure almost any hernia by means of injections producing fibrosis. It might have taken twenty or even thirty injections, but eventually the hernias were cured. The cure, however, did not last. At the time an adequate follow-up study was made, the recurrence rate[10] was approaching 100 per cent. The method was abandoned.

However, the irritant solutions had produced a fibrosis which was effective while it lasted. There was no doubt that after the cells of the body had carried off the irritant substances, and in the absence of any continuing stimulus, the fibrosis disappeared. The point of real significance was that the hernias remained cured for months. What was needed was a better injection material, one whose effect would be permanent. This conclusion seemed especially pertinent in Arabia where hernias of large size and enormous abdominal rings frequently present themselves. The tissues of the abdominal walls are poor and recurrences following surgical repair are very common.

The search for an agent which would produce permanent fibrosis was unsuccessful at first. The tannic acid derivatives used in the past were not tried. Since it is known that polythene sheets when finished with dicetyl phosphate give rise to a long-lasting fibrosis which can obliterate an arterial aneurysm, we tried injections of a suspension of dicetyl phosphate. This material is slowly soluble, however, and the fibrosis induced in the abdominal wall of a hamster disappeared in six weeks.

Eventually it was decided to test asbestos powder, grade 7To6, which can be sterilized and injected. For all practical purposes, this powder is permanently insoluble. Moreover, the particles injected are large enough to be visible to the naked eye and to require a No. 16 needle for the injection of the suspension. No cell can engulf such a large particle and carry it away. Our period of postinjection observation in one case now extends to more than three years, and there seems to be no tendency for the asbestos fibrosis to disappear.

The severest test of this method came with our first case. An enormous ventral hernia in an obese woman was repaired by means of a double ox fascia patch. The asepsis was imperfect and the patches sloughed. The hiatus in the abdominal wall was 4 inches in each diameter. After the infection had cleared, a suspension of asbestos powder was injected into the muscular and fascial edge of the hiatus and also into the thin peritoneal roof over it. A tight binder kept the abdominal contents in place. Nine days later the injection was repeated. One month later the patient was discharged with a normally strong abdominal wall which has served her perfectly up to the present time.

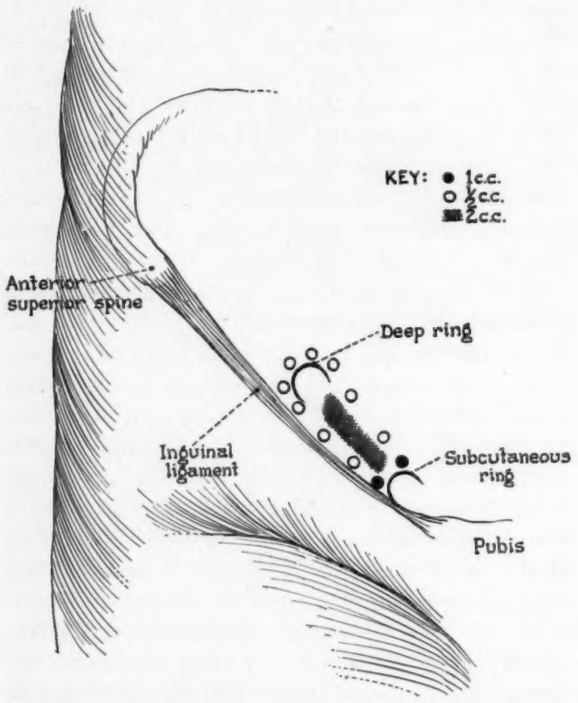

FIG. 1. Pattern of injection for inguinal hernia.

Asbestos injections were then used in treating nine patients with hernial sacs that had reappeared following treatment by the Bassini operation. The injection treatment was uniformly successful in these patients. A small quantity of suspension, usually 1 or 2 ml., was sufficient to cure the hernias permanently.

At about this time the opportunity came to test the new injection technic in Arabia, where surgical problems are so largely concerned with hernias of all types. This article is the report on a series of 200 cases of hernia treated in this way during a period of eight months. There was no selection of cases. Every patient with hernia who appeared for treatment received asbestos injections except three with strangulated hernia, who of course were treated surgically. If any patient had requested an operation, he would have been so treated; but during this period none of the patients did.

In this series of 200 cases there were no deaths, no serious complications and no thrombosis of the vessels of the testicle or atrophy of that organ. We did not observe any tendency toward overgrowth of the fibrous tissue such as has been reported after the use of powdered quartz.[11] The injected asbestos stimulates the cells of the host and causes a definite fibrosis. It is necessary to place the asbestos where the fibrous tissue is wanted, for the asbestos does not spread any further than the site reached by the injection. The fibrous tissue thus induced eventually shrinks but we are not certain just how much.

There were three instances of infection in connection with the injection technic. Only one of these three patients returned for treatment, which consisted of dissecting the infected area. In this case the success of the hernial treatment was not impaired.

All of the hernias in this series of patients were cured at least for the time being. Most of the small hernias were entirely corrected by one injection, but hernias of any considerable size usually required two and even three injections. At least three of the largest ones were injected four times, usually at intervals of approximately one week. These patients would have spent less time in the hospital if they had been treated surgically in the usual way.

In treating these hernias we injected 1 gm. of asbestos powder suspended in 10 ml. of saline; in some cases ½ gm. was used. To insure a brisk initial reaction we added four or five drops of sterile turpentine (0.04 to 0.05 ml.) to the suspension. In treating very large hernias with wide rings the dose was doubled, i.e., we used 20 ml. of suspension containing 2 gm. of asbestos.

The technic of injection is based on the work of twenty years ago, when such technics were worked out with great care. The purpose is to surround the internal ring with injected suspension to reinforce the pillars of the external ring and to reconstitute the floor of the canal. Figure 1 shows the desirable site of injection. The injected material should always be placed

below the external oblique fascia to avoid a disagreeable subcutaneous lump.

Following the injection the patient should wear a truss for one month; our experience has shown that a shorter period is not sufficient. We prefer that the patient spend this month at home if he is reasonably cooperative and intelligent in the management of his truss. Moderate activity is encouraged but heavy lifting is prohibited. Older patients inclined to be uncooperative are kept under observation in the hospital if possible; in any case, we try to re-examine patients at the end of one week and reinject the suspension if it seems indicated.

In Arabia a major problem in treating hernias by means of injection is the poor grade of trusses available. Recently we have brought from the United States canvas belt trusses with sponge rubber pads, and these have helped considerably in eliminating postinjection problems.

Our series of 200 cases of hernia were classified as follows:

Recurrence following previous surgical operation		22
Direct hernia		17
Femoral hernia		3
Epigastric hernia		1
Indirect inguinal hernia		157
(Classified as to size because external size corresponds in some degree to the size of the abdominal ring.)		
Mere bubonoceles to pigeon's egg size	50	
Hen's egg size	65	
Goose egg size and over	26	
Very large, coconut size	12	

The recorded figure of seventeen for direct hernia is certainly smaller than the actual figure. Lacking an operative exposure, however, nothing can be considered a direct hernia except a typical semi-globular non-scrotal protrusion. No doubt all of the twelve very large hernias had a direct as well as an indirect sac.

Of the series of 200 hernias, twenty-two were recurrences after surgery, and twenty-one of these hernias were small. Although one hernia was very large, it emerged through a disproportionately small hole. These hernias responded readily to treatment, no patient requiring more than one injection. A recurrent hernia emerges through walls of strong fibrous tissue; it is easy to inject the suspension into these walls, and the resulting fibrosis has been uniformly effective.

The seventeen cases of direct hernia were the most difficult to treat. Many required reinjection once or even twice. In these cases reinforcing the walls of the inguinal canal is of less importance than building up the floor of the hernia. The weak area is often 2 cm. across, or even more, and in these cases the intelligent use of the truss is especially important.

The three femoral hernias and one epigastric hernia were treated without difficulty.

Of the 200 cases there were 157 indirect inguinal hernias. The lesions varied in size; fifty were listed as bubonoceles or at least not over a pigeon's egg in size. When the method was first introduced in Bahrain, there was a surprising number of patients with these small hernias and we were fortunate in having such patients at the beginning of our experience. Many persons went home without any truss at all and had no further difficulty. At least five persons returned for a second injection, which almost certainly would have been unnecessary if we had then understood the importance of trusses and of postinjection care.

The only indirect inguinal hernias difficult to treat are the largest ones. In these the wall of the ring must be reinforced and the large, weak floor built up. As has been mentioned, it is frequently necessary to double the amount of suspension injected to accomplish these purposes.

The technic of treatment is more or less uniform for the different types of hernia. Spinal anesthesia is first induced, so that the accurate placement of the asbestos suspension can be accomplished without causing pain. Very careful cleansing of the skin through which the large needle is to be inserted is an important point. The injection itself is made under the guidance of a finger introduced from below into the external ring. The inverted skin of the scrotum over the fingertip does not prevent accurate placement of the needle. The suspension is placed where the resultant fibrosis will accomplish two objectives: (1) The fibrous growth must reduce the actual dimensions of the hiatus between the muscles. The injections surrounding the internal ring and those reinforcing the pillars of the external ring have this as their object and are especially important in indirect inguinal hernia, femoral hernia and in hernia following surgery. (2) The induced fibrosis must reinforce the transversalis fascia. In direct hernia this is the principal task; usually it requires more than one injection and also careful attention to the application and constant use of the truss. As has been men-

tioned, in the very large hernias both of these objectives must be accomplished; therefore the dose of injection fluid is doubled.

The final result of this treatment is very satisfactory. There is practically no postinjection pain or soreness, less indeed than that following surgery. There is no scar, and so far we have observed no recurrences. All of the cases have now been followed up for a minimum of six months.

Experience obtained after treating this series has added one procedure of some interest to our treatment of the very large hernias. One patient, having had two injections, refused a third and insisted on an operation; this insistence provided us with an opportunity to study the fibrosis resulting from the injections. The fibrous tissue was found to be quite satisfactory, indicating that one more injection would have completed the cure. A disappointing finding, however, was that there were no adhesions between the apposed peritoneal surfaces of the neck of the sac in spite of careful and intelligent use of the truss. We believed that firm adhesions between the peritoneal surfaces of the neck of the sac would have added materially to the strength of the repair made by the asbestos injections.

As a result of this operative finding, we now treat very large hernias by adding to the asbestos injections a separate injection of 0.25 to 0.5 ml. of clear turpentine, divided into four doses and carefully injected under the peritoneum just behind the narrowest part of the neck of the sac. One injection is placed above, one below and one on each side. This is a maneuver of some delicacy, for the fluid must not be injected into the tissues of the cord.

A sharp reaction follows this injection. The patient's temperature may rise to 101° or occasionally to 102°F. There is an active leukocytosis and some swelling which with careful adjustment of the truss is usually not severe. In the sixteen cases in which we have used this procedure there were two severe reactions, with considerable swelling. Although this passed off with no permanent damage, the experience was unpleasant for the patients. The procedure adds very greatly, however, to the effect of the injection treatment. Only three or four of the sixteen patients have required an additional injection.

Because of the time involved in treating large hernias by means of injections (up to six weeks in some cases) and the occasional severe reaction which follows the second injection in the neck of the sac, a few patients are asking for operative treatment. We have welcomed this, for it has made possible a combined attack on the problem. In this procedure the hernia, whatever the size of its abdominal ring, is repaired by means of a classic Bassini operation. Ten milliliters of asbestos suspension are then injected into the tissues on each side of the inner row of sutures, uniting the conjoined tendon with Poupart's ligament. This combined operation seems to have produced a very solid and satisfactory repair in the six cases treated thus far, although the results cannot be finally evaluated until more time has elapsed.

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PAPERS READ BY TITLE AT 55TH ANNUAL MEETING OF AMERICAN PROCTOLOGIC SOCIETY

Carcinoid Tumor of the Rectum

A STATISTICAL STUDY

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At the annual meeting of the American Proctologic Society in June, 1951, I presented a paper [*14*] reporting two cases of carcinoid tumor of the rectum. In the discussion that followed this paper, several members of the Society mentioned that they had seen such cases but had not reported them. Believing that numerous isolated cases were being found but not reported, I decided to assemble data regarding carcinoids of the rectum from a questionnaire which was to be sent to members of our Society, to selected surgeons such as Chiefs of Surgery of Medical Schools or of Surgical Sections of the Veterans Bureau Hospitals, and to a number of randomly selected members of various surgical societies.

In the questionnaire I asked these men to report their experiences with this lesion, which is controversial in name as well as in treatment.

Prior to 1942 only fourteen cases of carcinoid of the rectum had been reported in the literature. From 1942 to 1951 an additional sixty-six cases were published. However, since June, 1951, cases have appeared in increasing numbers and now over 200 appear in the literature.

The first carcinoid tumor was found in the appendix and erroneously diagnosed as adenocarcinoma by Merling in 1838 [*10*]. In 1907, Oberndorfer [*26*] suggested the name carcinoid and gave nine criteria for such a pathologic entity, stressing the point of benign growth. Masson [*24*] suggested the name argentaffin tumor because of black staining of the granules at the base of the cells with ammoniacal silver nitrate. Rosser [*31*] suggested the name neurocrine tumor on the basis that these lesions may be either malignant or benign, they may or may not reduce silver, and they originate from the neuroendocrine system [*16*].

There have been other names given to these neoplasms such as mucous membrane nevi, immature sympathetic neurocytomas, argentaffinomas, small cell carcinomas and neurocrine tumors. In this paper such lesions are designated as carcinoid tumors. However, there appears to be confusion when the name of carcinoid is mentioned. Immediately, the term, to some individuals, conjures spread of the lesion. In this paper carcinoid will mean the benign form, and malignant and/or metastatic spread will be designated specifically.

Collins, Collins and Andrews [*4*] listed sixteen theories presented in the literature as to the origin of carcinoid tumors of the gastrointestinal tract beginning with Lubarsch [*22*] in 1888 to Hertzog and Carlson [*17*] in 1935. In 1939, Popoff [*28*] postulated that the argentaffin cell represents a stage of functional exhaustion in a cycle of changes through which the mucus-secreting cell is constantly passing. In 1954, Thorson, Björk, Björkman and Waldenström [*33*] suggested that a vasoactive circulating substance, 5-hydroxytryptamine (enteramine or serotonin) might be the causal factor.

Gross and microscopic characteristics of this lesion will not be presented herein. Excellent

reviews may be found in the articles by Ariel [*1*], Cooke [*6*] and Forbus [*12*].

Carcinoids may appear anywhere from the esophagus to the anus. In various collective reviews [*13*], it is reported that 85 to 96 per cent of the carcinoids of the gastrointestinal tract

TABLE I
DEGREE OF ACTIVITY OF CARCINOID OF RECTUM

	Surgeons Reporting Cases	Surgeons Not Reporting Cases
Benign	40	18
Malignant	83	69
Potentially malignant	15	3
No opinion	15	182

are found in the vicinity of the ileocecal valve (appendix, cecum and terminal ileum).

Carcinoids in general may exhibit two grades of activity [*31*]: (1) benign infiltration, as in the appendix, where it may invade all coats of the bowel but halt permanently at the serosa (local invasiveness is not at present regarded as a criterion of malignancy in carcinoids [*13,34*]; (2) malignant, in which at the beginning, a very high metastatic tendency is present.

The findings which are reported herein consist of a tabulation from questionnaires which were sent to 1,260 surgeons throughout the country. Of 425 (33.7 per cent) answers received, 272 had no cases to report. In the remaining 153 responses, there were 464 cases reported; however, of these, eighteen were unconfirmed by biopsy and 106 cases have already been reported in the literature. I have taken the liberty of including the non-reported cases of some authors whose work is either in the process of publication or will be published in the near future. In all, there are 340 cases that have not as yet appeared in the literature. Of this total, thirty-seven were diagnosed but not treated, leaving a final figure of 303 cases as a basis for this survey.

QUESTIONNAIRE AND RESPONSES

Question 1. Do you consider carcinoid of the rectum benign or malignant? There were 230 responses to this query in the 425 questionnaires returned. (Table I.)

Foreman [*13*] believes that the term "malignant carcinoid" should be applied to tumors with proved metastases and that the remainder should be designated as "benign carcinoids." Other writers [*3,18,23,27,31*] include annular constricting lesions and multiple lesions as a criteria for malignancy.

TABLE II
SEX DISTRIBUTION

Male	170
Female	107
Unreported	26

TABLE III
RACE DISTRIBUTION

White	274
Negro	9
Not reported	20

Question 2. What were the ages of the patients in whom these lesions were found? The youngest was found to be nine years of age and the oldest eighty-one. The average age was 46.3 years in 182 cases in which age was given. Some replies gave age distribution in terms of groups; ten cases were in the age group of eighteen to forty and twelve in the age group of twenty-two to sixty. These were not included in the averages. There is one distinguishing feature with respect to age: there appear to be many more cases in the younger age groups reported after 1953 than before that year. Is this because of a more accurate diagnosis by the pathologist or because these lesions are now being routinely examined by a pathologist? It is also interesting to note that Ehrlich and Hunter [*9*] found carcinoids in ten persons of military age of 813 persons examined. More than twenty Veterans Hospitals were sent this questionnaire and not more than twenty-two cases have been reported.

Question 3. What is the sex distribution of carcinoids of the rectum? From previous reports, the sex is considered nearly equal [*19*].

The data which I have obtained is shown in Table II.

From these findings, it appears that there are approximately three cases in males for every two in females.

Question 4. What is the racial distribution? The answers are shown in Table III.

No real conclusions can be drawn from the data obtained because information as to rela-

tive numbers of white and Negro patients seen in the various clinics submitting replies was not given. This marked disproportion may be valid or it may be entirely misleading depending on such basic information.

Question 5. Where are these lesions located? While reports in the literature indicate that carcinoids have been found from the esophagus to the anal opening, our present interest is limited to the anus and rectum. The data in this survey indicate that the lesion may be found from the anocutaneous junction to 20 to 24 cm. above the pectinate line. Also, there seems to be no predilection for any one wall, although one writer [*5*] stated categorically that these lesions are only found on the anterior rectal wall.

Question 6. What are the distinguishing gross characteristics of this lesion? The replies to this are varied apparently because the lesion itself shows marked variability. Some of the answers received are shown in Table IV.

From this tabulation, one can readily see that this lesion may not be recognized by one who is not alert to its possibility and to its varying characteristics. Any one of the characteristics noted can fit the local tumors that occur in the rectum, whether or not they are benign or malignant.

Question 7. How frequently is carcinoid malignant? Previous writers have stated that only fifteen of 114 cases [*21*] have been found to have associated metastatic spread at the time of initial examination or following definitive operative procedures, and in these cases the course was rapidly progressive and always fatal. Of the 303 cases, forty-four (14.5 per cent) were reported as malignant on biopsy and showed spread either to the regional lymph glands, peritoneum, liver or direct extension to neighboring structures. There was one case reported as malignant, although not included in the aforementioned figure, which might bear closer scrutiny. In this patient a flat tumor was found on the anterior rectal wall, 2 inches above the pectinate line, which appeared yellow to the naked eye. Total removal was performed and the base fulgurated. The specimen was reported as adenocarcinoma or malignant carcinoid of the rectum. Approximately one month later the patient underwent abdominoperineal resection, apparently because of this diagnosis. One is hesitant to say that radical surgery was not required [*8,32*], but the diagnosis of the resected specimen was reported as resected anorectum (for adenocarcinoma) and diverticulosis of the colon.

Question 8. What is the prognosis when these lesions are malignant? Duration of life of those individuals with metastatic carcinoids was variable. However, if one discards the patients who lived less than one month or whose postoperative period was less than one month, and also excludes those cases in which survival time was not specifically stated (ten cases), thirty-four cases remain. The longest survival following radical surgery has been sixty months; in this patient a metastatic nodule was subsequently discovered. The average length of life in these thirty-four patients is 26.3 months following some type of radical surgery. This does not include one patient who is still living thirty-six months after exploratory operation with the instillation of intraperitoneal radioactive gold.

Thirty-two of the forty-four patients had some associated degree of malignant spread at the time of diagnosis; five patients showed spread at some later time and two showed spread between twelve and eighteen months after initial diagnosis. Information was not given as to time of spread in the remaining

TABLE IV
CHARACTERISTICS OF LESION

Intact mucosa	17
Ulcerated mucosa	10
Color:	
Yellow	27
White	5
Pale	5
Gray	2
Waxy	1
Submucosal nodule	34
Wide base	2
Elevated	9
Firm	21
Sessile polyp	13
Polyp with pedicle	19
Pedunculated polyp	4
Rectal polyp	7
Multiple polyps	5
Resembled adenomatous polyps	13
Annular narrowed lumen	4
Biopsy cut hard	5
Extrarectal	2
Malignant:	
Fluctuant	2
Ulceration	1
Fixed	2

five patients. The route of metastatic spread is shown in Table v.

The period of follow-up reported among so-called benign cases (259) was five months to sixteen years in sixty-eight cases, and averaged 94.6 months among the 110 cases in which exact follow-up periods were reported.

TABLE V
ROUTES OF SPREAD IN METASTATIC CARCINOID

Lymph stream	12
Blood stream	10
Contiguity	13
Not reported	9

TABLE VI
GASTROINTESTINAL LESIONS ASSOCIATED WITH CARCINOIDS OF RECTUM

Non-malignant	
Hemorrhoids	20
Fistula in ano	3
Pruritus ani	1
Diverticula	2
Adenoma of rectum	7
Pinworms	1
Polyp of sigmoid	1
Appendiceal carcinoid	1
Carcinoid of ileum	1
Duodenal ulcer	1
Amebiasis	1
Adenocarcinoma of transverse colon	1
Carcinoma of mid-sigmoid	1
Malignant	
Hemorrhoids	2
Duodenal ulcer	1
Carcinoma in rectosigmoid	2
Multiple carcinomas of rectosigmoid	1
Metastatic adenocarcinoma	1
(2 primary malignant tumors)	

Question 9. What intestinal lesion was found in association with carcinoid of the rectum? The answers are shown in Table VI.

Of the 303 reported cases of carcinoid of the rectum, there were only two in which carcinoid was found in other parts of the intestinal tract—one an appendiceal carcinoid, the other a carcinoid of the ileum. Resection was performed in both instances and the results were good.

Question 10. What is the therapy of choice for malignant lesions? Of the forty-four cases (metastatic) reported herein, three underwent exploratory procedure with no further therapy; one received intraperitoneal radioactive gold which stopped the ascites; three had anterior resections; one underwent a pull-through operation; three had some type of surgical operation, type unspecified; one had a "pelvic clean out"; and thirty-two underwent abdominoperineal resection.

Opinions as to type of therapy are listed in Table VII.

From these data, it can be stated that if the lesion has given rise to metastatic spread, some type of surgical procedure would be in order and that abdominoperineal resection has been the first method of choice; local resection of the lesion is the second most common choice.

TABLE VII
TYPES OF SURGERY

Surgeons Not Reporting Cases Who Believe Lesion to Be Malignant:	
Local resection	2
Electrocoagulation	4
Local excision	13
Abdominoperineal resection	13
Surgeons Reporting Cases Showing Metastatic Lesions:	
Local excision	1
Local resection	5
Pelvic clean out	2
Pull-through operation	2
Colostomy	1
Abdominoperineal resection	31
Surgeons Reporting Cases Who Believe Tumor May Be Either Benign or Malignant:	
Electrocoagulation	29
Surgical	40
Local excision	58
Local resection	10
Abdominoperineal resection	3
Depending on accessibility	
Electrocoagulation	4
Surgical	5
Depending on size of lesion	
Electrocoagulation	4
Surgical	5
Local excision	7
Local resection	7
Abdominoperineal resection	16

Among surgeons who have managed such cases, the therapy chosen has varied with size, accessibility and multiplicity of lesions.

Surgeons who have not had personal experience with such cases generally believe this lesion to be malignant, and hold opinions varying from a radical type of surgery to a conservative one.

Question 11. What is the usefulness of silver staining?

From the replies in Table VIII, it is believed that the men who answered this question are either very positive in their thinking that silver staining is of no assistance or believe proof is lacking that a positive silver reaction indicates

the course of carcinoids. From what I gather from the literature, a positive stain merely serves as an aid to the diagnosis, but a negative stain does not exclude a diagnosis of carcinoid or indicate an alteration in the treatment. Possibly with the isolation and use of serotonin, a new histochemical test may be developed to make possible a comparison of functional activity and malignancy.

TABLE VIII
USEFULNESS OF SILVER STAINING

Surgeons Not Reporting Cases:	
No use	11
Reporting uncertain	8
Surgeons Reporting Cases Showing Benign Lesions:	
No use	29
Uncertain	26
Helps	2
Surgeons Reporting Cases Showing Metastasizing Lesions:	
No use	15
Uncertain	14

CONCLUSIONS

After studying these data and attempting to correlate the answers obtained from the questionnaire, I have come to the following conclusions:

1. A definitive diagnosis of carcinoid must be made by the pathologist.

2. A diagnosis of malignant carcinoid of the rectum should not necessarily imply that the rectum should unequivocally be sacrificed from the diagnosis alone [*8,32*], but many other factors must be considered. However, multiplicity of lesions should be considered as an indication for radical surgery. Lesions larger than 2 cm. in diameter should be evaluated in the light of associated features and subsequent findings, such as height above dentate margin, whether or not the lesion is fixed or mobile, and whether or not the lesion is ulcerated. There seems to be no doubt that invasive lesions with proved metastases should be treated radically. All annular lesions should be excised by the most radical means, in stage procedures if necessary. There were four such cases in the forty-four malignant ones reported herein.

3. Lesions that are accessible and are under 2 cm. in diameter can be removed either by local excision, or by electrocoagulation or fulguration. Of this whole group shown in Table VII, only five patients had a recurrence; and of these in the metastasizing group, the shortest occurred within four months of the original operation.

To recapitulate, if a carcinoid of the rectum is the only lesion, its local eradication arrests the disease. It cannot be assumed, however, that because the lesion is small there may not be spread to other organs [*7,11,27*]. Although this pathologic entity may resemble the adenocarcinoma group, I am still not in accord with other writers who label this lesion adenocarcinoma, grade 1, carcinoid in type [*2,15,25*]. Were this true, rectums would be sacrificed needlessly. Metastasizing lesions that require extensive surgery, require it at the time of first examination in the large majority of cases. Isolated lesions should be treated by local eradication followed by careful observation of the patient [*30*].

4. Carcinoids occur at all ages; the youngest patient in this survey was nine years of age and the oldest eighty-one. With performance of more frequent proctologic examinations in children, the age range will widen further but the majority will be found in middle-aged individuals when carcinoma frequency is also at its height [*29*] and may be associated with various types of carcinomas of the gastrointestinal tract. The figures of Ehrlich and Hunter [*9*] are impressive: of 813 men between the ages of nineteen and thirty-eight, examined during World War II, ten had carcinoids. The same sources (men in the Armed Forces) are and have been available to the Veterans Hospitals, with the added advantage of a multitude of admissions over the years; yet very few cases of carcinoid of the rectum are registered in the various Veterans Hospitals in this survey. The cases in this survey, and other cases reported in the literature since 1953, show an increase in the number of young people presenting this lesion. Is this because of more thorough diagnostic investigation (sigmoidoscopic examination) or because of an increase in examinations of biopsied lesions of the rectum by the pathologist? Or perhaps the pathologist has become increasingly aware of the differentiation between adenocarcinoma, Grade 1, and carcinoid of the rectum?

5. Although the recorded figures in this survey reveal that males show a 3:2 predominance over females (thus differing from Jackman's [*19*] series which revealed a ratio of 1:1), as the number of reported cases increases, the disproportion may become even greater.

6. Carcinoid lesions of the rectum may be found at any level of the rectum. The reported predilection for one wall of the rectum no longer may be held valid. In this survey, lesions were found on every wall and at every height from the dentate line to the rectosigmoid. Incidentally, in one patient an abscess developed in the perianal tissue which, when incised, was found to arise from a carcinoid attached to the levator muscles.

7. A carcinoid of the rectum may not be grossly distinguishable from any other submucosal nodule or adenoma of the rectum, benign or malignant. Occasionally these lesions may have a distinct color [7] (yellow or pink) and one should always be alert to the possibility of this lesion. If the lesion can be removed at the time of the biopsy, it should be completely excised. Carcinoids give no characteristic symptoms and in the vast majority of instances will be found on routine sigmoidoscopy; in many instances the patient presents symptoms referable to another type of anorectal disorder.

8. Contrary to the previously reported survival period after definitive surgery, the patients with metastasis reported in this survey have lived much longer than those heretofore reported [*18,21,27*].

The majority of the patients with metastasis reported in the literature up to 1954 (fifteen in 114 cases) lived only a few months, while in this survey one patient has lived sixty months even though new metastatic growths have occurred. Another has lived fifty-eight months without new outbreaks. The average length of life, not including those who have survived less than one month (ten of forty-four), is 26.3 months for thirty-four patients. There is a higher percentage of metastatic cases in this survey (forty-four of 303 cases, or 14.5 per cent) than reported in 1954 [*21*] (13.1 per cent of 114 cases).

Of the fourteen patients who died after a diagnosis of malignant carcinoid was made, the longest survived forty-eight months; two died in the immediate postoperative period. One patient lived twenty-four months after an abdominoperineal resection; colostomy had been performed eighteen months previously for an annular constricting lesion of the rectosigmoid. One lived nine months with no treatment.

9. A positive silver stain helps to confirm the diagnosis of carcinoid of the rectum, but a negative silver stain does not rule out this lesion. A positive or negative silver stain in no way determines the anticipated course of the disease [*8,23,32*], although it was formerly believed that an absence of silver staining denoted a malignant lesion.

10. Carcinoid of the rectum seems to spread by any of the common routes [*23,27,30*], namely, lymphatics [*1,13,31*], blood [*1,7,31*] and by contiguity [*1,20*]. At present there is no basis for predicting a particular route of spread. The spread of metastases may be bizarre; one patient with lymph node involvement at time of abdominoperineal resection subsequently showed subcutaneous skin metastases without any further spread to the neighboring lymph nodes. This patient has survived four years postoperatively.

In conclusion, I want to express my deep appreciation to all who completed and returned the questionnaires used in this survey. Unfortunately, they represent only 33.7 per cent of those who received questionnaires. Perhaps even more significant information would have been obtained if there had been greater participation.

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Persistent Rectal Fistula Due to Metallic Mercury

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THE following case report presents complications due to the escape of metallic mercury into the intestinal tract from a Harris tube. Harris [1,2] reporting on the use of mercury in improving the technic of intestinal intubation, indicated that little if any danger to the patient results should the metallic mercury become free in the intestinal tract. Harris does not mention complications to be anticipated in situations in which the mucosa is not intact or in which a newly made suture line exists. Since Harris published his findings, Birnbaum [3], Chodoff [4] and Lindenmuth [5] have reported complications evidently due to the direct action of metallic mercury after its escape from the balloon into the intestinal tract. Crikelair and Hiratzka [6] described a case of intraperitoneal granuloma from mercury developing in a patient with a ruptured appendix.

CASE REPORT

A forty-six year old white woman underwent resection of the sigmoid and proximal portion of the rectum on January 26, 1951, because of an acquired megacolon. This procedure was followed by low, primary, end-to-end anastomosis. A Harris tube was inserted seven days postoperatively after the development of paralytic ileus. She responded well to conservative treatment, and the tube was removed at the end of five days. It was then observed that the balloon was ruptured with loss of the mercury. The patient was discharged from the hospital without complaints, but shortly thereafter a perirectal abscess and a rectovaginal fistula developed. A diversionary transverse colostomy was made followed by drainage of the abscess and repair of the fistula.

The patient was seen in consultation in January, 1952, because of a defect in the rectal wall which had not healed. A well formed and normally functioning transverse colostomy was present. Anorectal examination revealed a normal perianal surface and anal verge. On digital examination a defect, interpreted as a sinus, was discovered in the rectal wall at the 3 inch level and just to the right of the posterior midline. This opening readily admitted the tip of the index finger. A standard size sigmoidoscope could easily be passed along the rectal lumen to the 9½ inch level, disclosing no stenosis and a normal mucosal pattern, except for the sinus opening. When visualized, this opening exhibited a small amount of thin, purulent discharge and a few small tufts of exuberant granulation tissue. Vaginal inspection proved that the original fistulous connection with the vagina was successfully closed.

Granulations were repeatedly removed from the sinus and an attempt was made to stimulate healing by local treatment, all with indifferent success. While the patient was under observation and treatment, a tender, non-inflamed, perianal induration occurred in the right posterior quadrant about 2 inches from the anal margin. On digital examination the indurated process extended deep to the rectal wall from the perianal thickening to the defect previously identified in the rectum. X-ray examination revealed radiopaque material dispersed over the rectal and presacral areas. (Fig. 1.)

The indurated perirectal granuloma was opened and extensive curettage of a well organized fistulous tract was performed through a perianal incision. Numerous small globules of mercury were enmeshed in the granulation tissue which filled the tract. Rectal discomfort

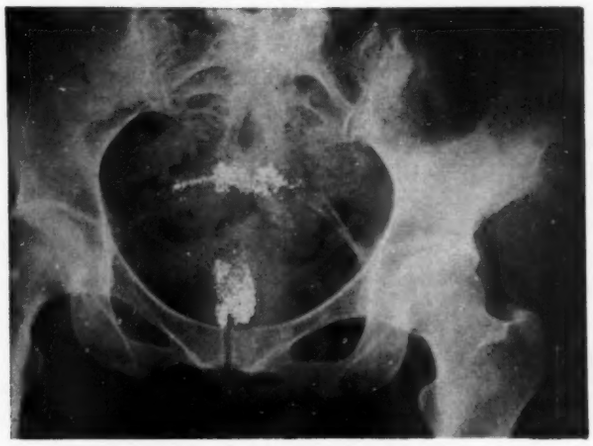

FIG. 1. X-ray of pelvis showing distribution of mercury in the retrorectal tissues prior to removal by surgery.

and discharge persisted intermittently following this procedure. The wound on the perianal surface healed normally, but the fistulous opening in the rectum at the 3 inch level, the original line of anastomosis, failed to close. From this opening a tract extended into well organized granulation tissue between the rectum and the sacrum.

On July 19, 1952, further surgery was performed using a retrorectal approach with removal of the coccyx. Extensive excision of the presacral granuloma, again containing numerous small globules of mercury, was accomplished. The opening in the posterior rectal wall was closed in two layers. The fistulous opening in the rectum healed and remained closed, but a persistent sinus developed in the scar through which the coccyx had been removed. The sinus and additional granulomatous tissue containing mercury globules were excised for the third and last time on February 26, 1953, and the transverse colostomy was closed. The patient experienced no further recurrence.

Histologic sections of the granulation tissue showed areas heavily infiltrated with neutrophils, small round cells and large mononuclear cells. In addition, occasional multinuclear giant cells of the foreign body type and several bits of black-staining foreign material were observed. (Fig. 2.)

SUMMARY

This case report reaffirms the findings in other cases reviewed, that complications may arise when mercury is free in the intestinal tract

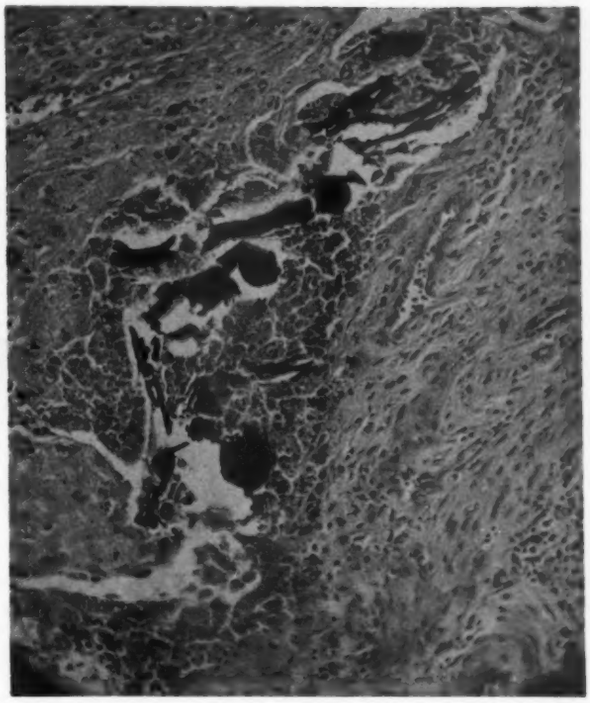

FIG. 2. Portions of mercury stained black and surrounded by granulation tissue containing numerous histiocytes and multinuclear foreign body cells.

and a break in continuity exists. In the case reported herein, mercury freed from a balloon escaped through the anastomotic line and interfered with healing of the anastomosis. A perirectal abscess and a rectovaginal fistula developed which, before the process was eradicated, resulted in a chronic mercury granuloma and a rectoperineal fistula. Complete and extensive excision of the granuloma in stages was done before final cure was accomplished.

CONCLUSIONS

In the presence of a defect in the wall of the bowel, free mercury within the lumen can pass through the wall of the bowel, act as an irritating foreign body and produce a mercury granuloma. When such complication exists, complete removal of the granuloma and its entrapped mercury by a bold approach must be achieved before cure can result.

Although the occurrence is admittedly unusual, the possibility of a complicating granuloma should be considered when passing a mercury-weighted tube into the intestinal tract where a break in the continuity of the bowel is known to exist.

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Modern Concepts in the Surgical Management of Diseases of the Colon and Rectum

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THE complete evaluation and proper preparation and management of the patient as a whole have made possible the current more comprehensive resections of the colon and rectum. The more important of these preparations include use of the antibiotics, more scientific and selective anesthesia, careful attention to fluid and electrolyte balance, the free use of whole blood, and the mechanical cleansing and partial sterilization of the bowel. As a result of this concept the surgeon has been freed from many restrictions. Advances in surgical technic have also improved our results. The combined efforts of the medical clinician and the surgeon are important in the efficient control of cases of cancer and colitis.

In a study of 2,341 cases of cancer seen at the Presbyterian Hospital, Grinnell [7] points out that the operative mortality rate in cases of colonic cancer fell from 31.3 per cent in the 1916–1920 series to 5.3 per cent in the 1945–1950 series. Of the cases of rectal cancer, the mortality rate fell from 40.9 to 6.7 per cent in the same periods. Grinnell further states that the five-year survival rates for patients treated with curative colonic resections from 1936 to 1945 was 67.9 per cent for those without node metastases and 36.7 per cent for those with node metastases. The five-year survival rate for patients with cancer of the rectum treated with curative abdominoperineal resections and perineal proctectomies was 67.4 per cent for those without node metastases and 34.6 per cent for those with metastases.

The obligation of the surgeon is not only to save life and cure the patient but also to preserve function and avoid mutilation. However, we must not let our enthusiasm for the retention of sphincters and the reestablishment of bowel continuity interfere in any way with our performing first the necessary radical resection for cancer. Only after removing the tumor and its lymphatic spread can we decide upon the final procedure to be employed. We must perform resection first.

Because of the high percentage of failures of the ultra-radical pelvic eviscerectomies, with their attendant high costs and devastating side effects, there is considerable question as to the continuation of this mutilating surgery. We should press the radical attack on cancer wherever it gives reasonable promise of success but discontinue those procedures which are not attended by compensatory curative results. It is time for us to take stock and face up to our true accomplishments.

Preoperative preparation of the bowel with antibiotics has been of great value, but this cannot replace skillful surgery. There are surgeons who believe that antibiotics are unnecessary. I cannot agree. Postoperatively the antibiotics have reduced complications. Blood volume studies have often indicated the need for the administration of several liters of blood in the depleted patient, whereas the blood count alone would have suggested a normal condition. Fluid and electrolyte balance can be much more easily maintained if the laboratory is well equipped to do prompt and accurate blood volume, prothrombin, calcium and potassium determinations.

It is important that emergency sigmoidoscopy and barium enema facilities be maintained at all times during the day and night. This cannot be overemphasized. Often these findings facilitate much earlier operations and contribute in lowering the mortality, particularly in the patient with obstruction. The

House Staff should be properly trained in these procedures.

In the preoperative preparation of the non-depleted patient with cancer who has no obstruction, it is my practice to admit him to the hospital for three days before operation and to give him tetracyn or achromycin,® 250 mg. twice a day for these three days. A low residue diet is instituted on admission, with clear fluids, strained orange juice, jello and hard candy on the day before operation. The caloric intake should be sufficient so as not to deplete the patient. Instructions are given the patient to take 1½ ounces of castor oil in the afternoon of the day before admission. Fleet's phospho-soda, ½ ounce with a glass of hot water, is given in the morning of the day preceding operation. Each afternoon saline enemas are given until the return is clear. This usually results in a clean bowel. Depleted patients and those with partial or complete obstruction require longer hospitalization for restorative measures.

Partial obstruction usually can be relieved by repeated saline cathartics together with enemas or colonic irrigations. If there is no vomiting, clear fluids, jello and hard candy are given orally. A nasogastric tube is indicated for nausea or vomiting. Dehydration is relieved by appropriate parenteral fluids. Transfusions are administered as indicated. Vitamins and minerals are given in the infusions. Those patients who do not yield to these measures require some form of decompression.

Nasogastric suction is extremely important in the postoperative period to prevent vomiting. It is my impression that the routine use of this suction will greatly reduce the disruption of wounds. It should be maintained in all colonic and rectal resections until function of the bowel is re-established.

Most of the obstructive lesions are in the left side of the colon. When the location of the tumor permits, I prefer using transverse loop colostomy rather than cecostomy. This procedure completely diverts the fecal stream and makes it easier to clear out the bowel proximal to an obstruction. The colostomy should be placed as far away as possible from the obstructing lesion to avoid interference with subsequent definitive resections. It is my practice to use this loop colostomy for decompression of the low anterior resections, with possibly insecure anastomoses, as well as for the rare pull-through procedures.

Preparation of the patient with colitis requires considerable individualization and varies greatly with the acuteness of the process. However, the preparation is somewhat the same as that for the patient with cancer, except that cathartics and enemas are usually eliminated. Generally these patients require more blood to restore normal blood volume.

Surgery remains the only curative measure for cancer of the colon and rectum. Radiation is palliative at best, with the possible exception of the very small epidermoid cancers of the anus. Even for these my preference is wide local excision. Hormones, isotopes and chemicals have not yet been developed to a generally useful stage. However, Brayer et al. [2] reported that 130 to 150 mc. of colloidal gold (Au-198) within the abdomen usually effectively suppresses the effusion from malignant disease for periods as long as six weeks.

Colonoscopy is an extremely valuable adjunct in colonic surgery in searching for and removing polyps. In several instances I have used it in conjunction with the electric snare to locate and remove polyps adjacent to resections of the bowel for cancer.

It is basic in cancer surgery to remove the tumor with generous segments of bowel on either side of the tumor, with as much as possible of the vascular bed and draining lymph nodes and channels. From this standpoint, cancer of the cecum, ascending colon and sigmoid offer the most favorable prognosis.

Cancer of the hepatic flexure presents a poor prognosis, for invasion of the lymphatics and vascular channels and areas of direct spread retroperitoneally are among organs which cannot be removed, namely, the duodenum, the head of the pancreas, the main bile ducts, the liver and the superior mesenteric vessels.

Cancer of the transverse colon requires interruption of the mid-colic vessels and dissection (as wide as possible) of the lymphatics around the superior mesenteric vessels, followed with colocolostomy. It does not seem necessary to remove the entire right side of the colon, as has been suggested by Rosi and Capos [10]. The prognosis in these cases is better than when the tumors involve the flexures, even though many of the structures involved in the area of spread cannot be removed.

In cancer of the splenic flexure a more radical attempt is being made to achieve better results by more inclusive operations. These resections now include the tumor with wide segments of

bowel on each side, the spleen, the tail of the pancreas and sometimes a portion of the invaded stomach along with as much as possible of the lymphatics, including those above the celiac artery. Again the spread is often into structures which cannot be removed and the prognosis is poor.

There are a few instances, I believe, in which one is justified in performing wide local resection of cancer of the rectum, rather than performing a mutilating abdominoperineal resection with permanent colostomy. This wide local resection may be curative in highly selected cases or palliative in extremely poor-risk, aged patients with small cancers. These tumors suitable for wide local excision are the small, projecting polypoid cancers. Great care must be exercised to differentiate these from the small, punched-out, ulcerating cancers which are highly malignant and require the most radical resection, usually with permanent colostomy.

Almost all of the cancers of the descending colon, sigmoid and rectum require high ligation of the inferior mesenteric artery at its origin from the aorta, including the left colic vessels. The inferior mesenteric vein is ligated as near as possible to the splenic vein. In addition, all possible tissue, including lymph nodes, is removed from the anterior surface of the aorta from the duodenum down into the pelvis.

As a general rule, in the cancers located between the anal verge and 6 cm. above there is pretty universal agreement that abdominoperineal resection is the procedure of choice.

Those cancers located at 10 to 12 cm. from the anal verge, at or just above the peritoneal reflection, in the less advanced state, can be adequately removed with anterior resection and a low intrapelvic anastomosis. The distal clamp must be placed so that at least 6 cm. of bowel can be excised below the tumor in order to include the distal spread of 4 cm. as described by Grinnell [8]. The principal exceptions are some of the more advanced tumors with invasion of the surrounding pelvic structures. In rare instances a vascular anomaly or an inadequate marginal vessel will render a proximal loop non-viable. In this event permanent colostomy may be necessary or the entire right colon may have to be removed, followed with ileorectal anastomosis.

The debatable area with respect to choice of operation is between 6 and 12 cm. from the anal verge. The surgeon may have the choice of abdominoperineal resection with colostomy, anterior resection with a very low intrapelvic anastomosis or abdominoperineal pull-through after the method of Hochenegg in rare instances.

Great individualization of operative procedures in this area is required. Here perhaps more than anywhere else the selection depends on the experience and judgment of the surgeon. Wherever consistent with adequate surgery for cancer it is our strong desire to save the sphincters and maintain bowel continuity. We must not let our enthusiasm for retention of sphincters or any promise to the patient interfere with adequate resection of cancer first. Important considerations in this choice are: the extent of the tumor, invasion of the pelvic wall, adjacent organs or ureters, widespread lymph node enlargement or metastases to the liver, viability of the available loop of bowel, adequate blood supply to insure secure anastomosis and sufficient length of bowel to follow the contour of the pelvis to reach the anal outlet or permit secure low anastomosis without tension.

Abdominoperineal resection is usually indicated in the more advanced or extensive cancers. Frequently after the rectum has been mobilized the tumor comes well up into the operative field. If at least 5 cm. of bowel can be removed below the tumor and an intrapelvic anastomosis can still be accomplished, I prefer this low anastomosis. There are fewer complications in this procedure than with a pull-through. The very low anastomosis is often technically difficult and insecure. Some form of decompression is desirable. A completely diverting loop transverse colostomy is usually more efficient than a cecostomy.

If at least 5 cm. of bowel are free below the tumor but for technical reasons cannot be removed and an intrapelvic anastomosis is performed, abdominoperineal pull-through may be considered. However, the pull-through procedure is extremely limited in application. It should not be used unless the levator ani muscles and both sphincters can be retained. Extreme care must be exerted to insure a very long loop of the left side of the colon which can lie freely and follow the contour of the pelvis without any tension or tenting whatever. Great care must be exercised to insure good viability. Free bleeding must be observed from the cut end of the sigmoid projecting at the anal orifice. If there is any tension or loss of viability, pelvic abscess may result from ne-

crosis or retraction of the distal loop. It is my practice to perform loop transverse colostomy in all of these cases. It is far better in the questionable cases to perform abdominoperineal resection with colostomy because the rate of cure is higher, there are fewer complications and the patients withstand the operation better.

Cole [5] first suggested ligation of the bowel above and also where feasible below the tumor to prevent implantation of cancer cells into the wound or the lumen above and below the anastomosis as a result of mechanical manipulation during mobilization of the segment. This procedure also reduces the possibility of spillage of cancer cells into the peritoneal cavity during the anastomosis.

Metastases to the liver *per se* are no contraindication to removal of a resectable cancer. In rare instances isolated metastases to the liver may be removed. There is some reason to believe that removal of the primary tumor in some way inhibits growth of the metastases to the liver or even causes their disappearance.

In ulcerative colitis, when conservative measures have failed, it is the practice of many surgeons to perform ileostomy followed with complete removal of the colon and rectum in one operation. I am somewhat more conservative. It is my preference to establish an ileostomy, with suture of the circumference of the cut end of the ileal wall to the skin margin, as well as to attach the terminal 8 or 10 cm. of the terminal ileum to the adjacent-abdominal wall to discourage prolapse. The terminal 3 or 4 inches of normal ileum and colon are removed down to the lower sigmoid just above the peritoneal reflection. The distal segment is closed and left in place, to be resected in most instances some three to six months later by abdominoperineal resection.

Most patients do well after ileostomy and radical removal of the colon and rectum in one operation. However, on our service at the Presbyterian Hospital two patients died rather suddenly of what was thought to be pulmonary embolus approximately one week after the complete radical procedure in one stage. Autopsy in each case failed to reveal any cause of death. Since then I have preferred the two-stage procedure, with which my patients have done well.

One of the most important advances in surgery for colitis has been the Turnbull [12] ileostomy. The serosa and muscularis are excised from the distal 2 cm. of the terminal ileum and the mucosa is then sutured to the skin margin. This is said to prevent local peritonitis, reduce the tendency to prolapse, almost eliminate the excess loss of fluid from the ileum and overcome the intestinal obstruction which often follows the usual projecting ileostomy. It has made ileostomy a much less hazardous procedure. In my own experience, it is not necessary to remove the serosa and muscularis. The same result seems to be accomplished by suturing the entire thickness of the ileal edge to the skin margin.

Another extremely important practice is to cement on an ileostomy bag at the end of the operation. This prevents excoriation and makes the ileostomy immediately bearable.

In the rather infrequent fulminating colitis these patients are too sick not to undergo surgery. It is my belief that these patients would be given a much greater chance of survival by earlier ileostomy and resection of most of the acutely diseased colon. This procedure has the effect of removing the source of infection and toxicity much as is done in excising a carbuncle or incising a large abscess.

Cancer of the ovary, metastatic or by direct extension from cancer of the large bowel, must be kept in mind. An incidence of 3.44 per cent of secondary cancer of the ovary in a series of 493 patients from the Presbyterian Hospital has been reported [3]. This was presented before the American Proctologic Society in 1951. The final results are extremely poor. It is suggested that the ovaries be carefully palpated and inspected wherever possible during all laparotomies, particularly for cancer of the large bowel. It is further suggested that prophylactic oophorectomy be performed upon all women beyond the child-bearing age of forty who are undergoing resection of the bowel for cancer, and further that bilateral salpingo-oophorectomy and complete hysterectomy be performed in conjunction with resection of the bowel when frozen section demonstrates cancer of the ovary. If definitive studies later show cancer of the ovary, the radical gynecologic procedure should be carried out as soon as possible.

Segmental resection of the colon because of the presence of a few polyps has been suggested recently by Lillehei and Wangensteen [9]. We must maintain an open mind and await the results of a sufficient number of these operations before we can decide upon their value.

Polyps grow slowly. Visualization by colonoscopy and local coagulation or excision by snare or by limited resection of the bowel for sessile or suspicious lesions has been so satisfactory that a more radical approach seems drastic.

The coexistence of carcinoma of the cecum in association with acute appendicitis must be kept in mind whenever a markedly indurated cecum is found with an acute inflamed appendix. In a study of the cases at Presbyterian Hospital I found the prognosis to be extremely poor. It is hopeless when the true condition is not recognized at the first operation. When there are suspicious lesions, the surgeon should open the cecum for observation and to obtain material for frozen section or definitive study. If cancer is found, immediate radical resection must be performed. If subsequent studies reveal cancer, the earliest possible resection should be performed.

Diverticulitis is sometimes very difficult to differentiate from cancer. Wherever a patient continues to bleed over a period of time, especially in association with abdominal pain, cramps and distention, the safest course is radical resection. Even with the specimen in the surgeon's hand at operation it is often impossible to be sure that the tumor is not cancerous.

Prophylaxis of cancer of the large bowel: It is estimated that cancer is responsible for 225,000 deaths annually in the United States [1] and that these figures are offset by 23,000 cures [11]. It is also estimated that in the United States annually there are approximately 14,500 cases of silent or subclinical cancer [11]. Studies of the National Cancer Institute [1] in 1937 and 1947 among 14 million people indicate that one-half of all cancer is in sites accessible to direct examination in physicians' offices.

Cancer of the rectum alone represents 6.5 per cent of all cancers in the male and 4.5 per cent in the female [1]. In the entire colon and rectum 70 per cent of the cancers can be visualized with the sigmoidoscope and 50 per cent can be palpated.

These data should provide ample enthusiasm for all of us to do everything within our power to establish a system by which the detectable cancers can be located and eradicated.

In the detection and removal of early cancer and precancerous polyps lies our greatest hope of reducing cancer mortality. By the eradication of polyps the incidence of cancer of the large bowel would be greatly reduced, probably more than 50 per cent.

If every patient over forty years of age could undergo sigmoidoscopy annually, practically all cancers of the rectum and lower sigmoid could be prevented. Barium enema is not reliable in the detection of lesions of the rectum and lower sigmoid and should never be used prior to sigmoidoscopy.

It is far beyond the capacity of the Cancer Detection Centers to examine all of our people. The cancer detection examination as performed in these centers is no more than can be easily done in our private offices. The private practitioner is the first line of defense.

The basic concept of the American Cancer Society and the National Cancer Institute is that the vast amount of early cancer detection must be performed in the physician's office. It is the responsibility of all surgeons specializing in proctology and the colon to do their part in this program.

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The Obstipation-Prolapse Syndrome in Infants

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From the beginning of my proctologic practice I have seen infants, from several months to six years of age, referred by pediatricians, family physicians or anxious parents with the complaint of obstipation from birth that has failed to respond to laxatives, dietary measures and efforts at training. Every proctologist must have had many identical referred patients. The object of this paper is to present a method of treatment that has proved eminently successful and to suggest some probable reasons for the existence of the condition and the efficacy of the method of treatment.

A review of the available literature for the past sixteen years has failed to reveal any similar thoughts or mode of attack. There are articles that recognize the obstipation, or obstinate constipation, and attempt to treat it with bulk laxatives, low residue diets, fruits, vitamins, cholinergics and other measures. Murdoch [*1*] recognizes the connection between sigmoidorectal prolapse and constipation, and many others have described rectal prolapse, giving it names and describing treatment, but have not visualized what I term the obstipation-prolapse syndrome.

Most of these children are delivered normally, are breast- or bottle-fed and do well for a short time. However, within a few weeks after birth obstipation occurs, requiring milk of magnesia, mineral oil or cascara to keep the stools semi-liquid. Enemas or glycerine suppositories are often necessary to produce evacuation. The infant cries when trying to defecate and seems to hold back because of pain. A physician usually reassures the family that the baby will "straighten out" with time. He changes the formula and prescribes enemas, suppositories and laxatives. When these measures fail, the parents seek other medical advice and frequently consult one or more pediatricians who change the formula, dilate the anal canal, treat visionary fissures and suspect megacolon without benefit. With time, occasional slight bleeding at stool is noted. This leads to a diagnosis of hemorrhoids and in some instances brings the patient to the proctologist.

My earlier cases found me bewildered. X-rays of the colon were reported as normal; stools contained considerable free fats and soaps, but commonly did not reveal symptoms in this age group; visual examination of the anus, rectum and sigmoid was within normal limits; and stools were negative for ova or parasites.

Evidently this was a dietary and a functional problem, so various diets, laxatives and antispasmodics, forced fluid intake, training schedules and even cholinergic drugs were tried. A few patients were helped, but my results were as disappointing as those of the pediatricians.

About this time I began to see a few adult patients who had undergone hemorrhoidectomy. The wounds were well healed and the anal canals were adequate, but all patients complained that they had great difficulty defecating, sometimes being unable to pass a stool without an enema even though it was "right down there." Although the stools were almost fluid, frequent enemas were required. The patients complained of a feeling of incomplete evacuation, heaviness in the rectum and aching across the sacral region.

The only abnormality found on examination of these patients was a bulging and sagging of the rectal mucosa above the hemorrhoidal area on straining. They desired relief, but without further surgery. In desperation, a trial treatment of 8 per cent phenol in almond oil injected into the submucosa of the bulging areas was tried. The results were mutually satisfying.

Some patients reported almost complete relief after the first treatment, others required three or four.

This experience led me to re-evaluate my reportedly normal findings in infants with somewhat similar complaints. Stools of putty or gummy consistency were found, it is true, which indicated that the diet was at least partly at fault. The histories revealed that the patients did not eat well or were very choosy in their diets, being especially fond of bread, crackers and milk, but disdaining vegetables, fruits, fruit juices and meats. However, when they cried during the examination there was a bulging of the rectal mucosa, mostly in the posterior quadrants, that simulated very closely what had been noted in the adults who complained postoperatively.

This finding led me to add injection into the bulging rectal wall, as I had done in adults, to diet and training in treating these infants. The results have been so gratifying that when sigmoidoscopy shows no abnormality, x-ray of the colon is reserved for those who do not respond to therapy. So far, x-ray has not been necessary. Incidentally, I have never seen a polyp cause similar symptoms.

Upon associating with Dr. W. Thomas Brockman five years ago, I was pleased to find that he used a similar program with equally good results. It is possible that other proctologists have arrived at similar conclusions without reporting them.

PROGRAM OF TREATMENT

Injection Program. This consists of weekly submucosal injections of 8 per cent phenol in almond oil, containing 1 gr. of menthol to the ounce, into the bulging areas until they are stabilized. From 1 to 2 cc., largely in the posterior quadrants, may be used at each site. There is no undue discomfort associated with the injection, but the patients do not like the anoscope or the position.

Training Program. This consists of 12 to 24 ounces of plain water taken as an enema after breakfast each morning for two to three weeks, then every second morning thereafter if the patient has not had a stool. These are given with a fountain syringe (not an infant bulb syringe) with the patient in the head down position across the mother's lap. Very few patients have required many of the second course of enemas.

Dietary Program. (1) In older children, all or most of the sweet milk is withheld and country buttermilk is substituted if available. Dairy buttermilk may be used. (2) In babies on the bottle, skimmed milk is used, but buttermilk is preferable if they will take it. (3) Bread, crackers, cake, ice cream, Irish potatoes, chocolate candy and all carbonated beverages should be markedly restricted. Hard candies do not appear to react unfavorably except to depress the appetite for more desirable foods. (4) Meat should be eaten twice a day. Lamb, veal, lean beef, roast chicken and calves' liver are best. Baked fish is satisfactory. (5) Feeding between meals is almost necessary in children, but should be limited to fruits, fruit juices and one small cracker or cookie. (6) Cooked leafy vegetables, carrots or string beans should be eaten twice a day. (7) Cooked or canned fruits should be eaten in good portions twice a day. Raw fruits are sometimes equally satisfactory, sometimes not. (8) Citrus juices and canned apple juice should be freely available and as much allowed as the patient will take. Adequate fluid intake is important. (9) Unconcentrated standard cod liver oil three times a day before meals in doses of one teaspoonful for infants to one tablespoonful for older children seems to help the appetite and to have a salutary effect on the gastrointestinal tract.

Incidental Treatment. Maiden aunts, uncles and grandparents should be kept at a distance unless they are unusually hardhearted. Baby sitters, domestic help and practical nurses are not a substitute for intelligent and cooperative parents. If the patients are on vitamin preparations when seen, they are left on them; with cod liver oil, vitamins are not necessary. Hydrophilic colloids have occasionally been used in specific patients, but are not usually necessary.

FACTORS TO EXPLAIN THE SYNDROME

Undoubtedly, improper digestion of fats plays a great part in causing this condition in the newborn, and improper diet contributes to the symptoms in older patients. Either will account for the putty or gummy stools, but cannot be the whole answer since trials of diet and regimens of training have failed to solve the problem.

A mechanical factor must be added. Gorsch [2] states that in infancy and childhood the rectum is cylindric in shape predisposing to

intussusception and prolapse. Bacon [3] mentions lack of support because of poor development of the lateral ligaments, looseness of the infant's rectal walls and the absence of the supporting sacral curve. Thus, every factor necessary for a concealed prolapse is present. The condition described herein is similar to Buie's [4] concealed prolapse and almost identical with Bacon's [3] internal prolapse (not procidentia), but it is not marked in its early stages and must be looked for. I am not certain whether it is merely mucosal or whether the whole rectal wall participates. I am certain that no actual block of the lumen occurs with this sagging and that there is a pull on the bowel wall during the act of defecation. It is well known that traction on the bowel causes pain. The infant holds back because defecation is a painful experience, and infants do not like discomfort. The longer the condition persists, the more the forced stools prolapse the bowel until finally some bleeding may result from abrasion or actual grasping of the mucosa by the sphincters.

In the older child the same process is present, but with an added psychologic factor. He has been conditioned almost from birth to consider evacuation an unpleasant experience. Explaining will not clear the psychic trauma which is slow to heal and requires an active attack with demonstrable methods to break the ingrown fear of and the conditioned reflex against having a stool.

RESULTS

In the very young infant there is little doubt that correcting the consistency of the stool to decrease the tugging effect on the bowel helps; but in treating the syndrome, its function is also to eliminate this pull after injection is made into the bowel so that the tissues may set. The daily morning enema not only eliminates the tug but also begins training in regularity. True relief is obtained when the sagging bowel is stabilized so there is nothing for the stool to pull on to cause discomfort and when normal stools are maintained to protect against relapse.

In the older child the aforementioned remedial factors act to eliminate the mechanical difficulties. In addition, he is helped to overcome his psychologic difficulties by the office visits for injection. At first he is very unruly and complains bitterly at each step of the treatment. Later he is more stable, but always resents the embarrassing position and the instrumentation, although not the injection itself. You might say that he decides that he prefers having bowel movements to having injections. When regularity has been established and the mechanical and psychologic problems are overcome, the result is a happy patient and happier parents. In our office we see thirty or more of these patients a year and should see more.

The average patient offers no real problems, but the following three case reports seem justified.

CASE REPORTS

Case I. This eighteen month old white female infant, had no history of severe illness, but had been receiving mineral oil three times a day since she was three months of age. She had had treatment with salves and silver nitrate for "fissure" since she was five months old. She was a very finicky eater and cried at stool as if going into a convulsion. Examination did not reveal a fissure or any protrusion.

She received four injections at weekly intervals, and in addition was given the diet, cod liver oil and enemas. An overly solicitous aunt who had charge of her did not cooperate as to the diet. The patient's condition improved somewhat, but the character of the stools did not become normal in two months. At this stage the aunt was given a thorough explanation of the situation. She cooperated and three months later reported that the child had been having normal stools, was eating well and seemed happy since shortly after the last visit.

The maiden aunt was the unfavorable factor in this case.

Case II. This two and a half year old white male infant had had no severe illnesses, but had been constipated since birth. X-rays of the colon were reported as normal. The child had been given many laxatives and dilatation had been performed. Impactions had occurred and enemas were necessary for evacuation in addition to the laxatives. No bleeding or visible protrusion had been noted.

A diaphragmatic anal stenosis was found and was sectioned under anesthesia. The resulting anal canal was normal, pliable and adequate. Despite diet and enemas, he continued to be obstipated. A concealed rectal prolapse was found, and injections were given at intervals of one to two weeks because of difficulty in

obtaining regular visits. Both parents worked and he was left with a hired girl who fed him crackers and bread between meals. He drank lots of milk, but took little vegetables, fruit or fruit juice.

His parents reported that he was essentially all right for a while, but the problem of their being away from home still existed and his symptoms returned. A small injection was given in October, 1954, milk was completely eliminated from his diet and better cooperation in feeding was obtained. He has been well regulated since that time.

This case demonstrates that the elimination of a true mechanical obstruction and injection, without proper attention to diet did not effect a cure, but combined with cooperation an excellent result ensued.

CASE III. This six year old white boy had a history of not having had a normal defecation since birth. His mother thought he ate as well as most children, but questioning refuted this. He drank more than a quart of milk a day. He had been on diets and under the care of competent pediatricians many times. A concealed prolapse and putty-like stool in the rectum were found.

Injections at weekly intervals, proper diet, cod liver oil and enemas gave excellent results in four weeks. The patient has been followed up for more than two years. He has a good appetite, is growing and energetic, and requires no laxatives or enemas. He has one stool of normal character every second day. Evidently this is his normal bowel habit.

SUMMARY

The problem of obstipation in the infant with concealed prolapse of the rectum has been presented, and treatment by injection of sclerosing solution beneath the sagging mucosa, correction of diet, training with plain water enemas and psychologic attack has been outlined.

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Massive Rectal Bleeding

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RECTAL bleeding is a common complaint in proctologic practice. The causes are numerous and varied, and the proctologist must be on the alert for disease anywhere in the gastrointestinal tract intruding upon the rectum. The following case is presented to illustrate one of the rarer causes of rectal bleeding, but one which may be diagnosed in the office.

CASE REPORT

The patient, a fifteen year old boy presented himself to the proctologist's office on October 1, 1954, with the complaint of rectal bleeding of four days' duration.

One week previously he had noted sharp periumbilical pain which lasted twenty-four hours. No anorexia, vomiting or abnormal stools were noted. Two days later the pain recurred and the patient passed a black stool. Another bowel movement later in the day was stained with bright red blood, and a recurrence of crampy abdominal pain was noted in the left lower quadrant of the abdomen. The patient had two bowel movements a day during the next three days, each stained with bright red blood, and therefore sought medical advice.

Sigmoidoscopy performed in the office was unsatisfactory due to bleeding which obscured the bowel; however, no abnormalities were noted in the anus or lower rectum. The boy was admitted to St. Vincent's Hospital with a diagnosis of bleeding from a Meckel's diverticulum.

Past history revealed that he had always been anemic and sickly and that he had had an episode of bright red rectal bleeding at the age of twenty months. At that time he was hospitalized for two weeks, requiring several transfusions. However, repeated x-rays revealed no abnormalities of the bowel. He was also said to have had pinworms which were blamed for intermittent crampy pain in the left lower quadrant of the abdomen during the preceding year. There were no tarry stools or rectal bleeding since infancy, but occult blood was detected on one occasion during the episodes of pain in the left lower quadrant of the abdomen.

There were no known congenital anomalies in the patient's family.

Physical examination revealed a thin, very pale, apprehensive boy who seemed somewhat retarded for fifteen years but in no acute distress.

Blood pressure was 116/68, pulse 112, and temperature 98.6°F. The physical findings were confined chiefly to the abdomen which showed mild spasm of the rectus muscles with tenderness elicited in the left lower quadrant on deep palpation. There was no rebound tenderness or palpable masses. Rectal examination revealed no masses or hemorrhoids and no tenderness, but dark stool and bright red blood were noted on the examining finger.

Laboratory findings were as follows: red blood cell count, 2.8 million per cu. mm.; hemoglobin, 7.5 gm. per cent; white blood cell count, 22,000 per cu. mm. Urinalysis was essentially negative. The patient's blood was typed and cross matched; 500 cc. of blood were given and a gastrointestinal series and barium enema were scheduled. The blood pressure, which had dropped to 90/80, was stabilized at 112/70 that night after administration of 500 cc. of blood.

The next morning the patient vomited his breakfast and passed a large, dark red stool. A repeat complete blood count revealed a red blood cell count of 2.2 million per cu. mm. and a hemoglobin of 6.5 gm. per cent. Despite the administration of 1,000 cc. of whole blood, blood pressure remained around 96/50. Therefore, the patient was prepared for surgery.

At operation, performed that evening, a right paramedian incision was made 2 inches above and below the umbilicus. A Meckel's diverticulum was present about 2 feet above the ileocecal valve. It was adherent to the mesentery of the ileum and measured 2 cm. in length. Because of the difficulty in freeing the diverticulum, local resection of the ileum and ileoileostomy were performed. On opening the ileum, a bleeding point was noted in an ulcer located just at the neck of the diverticulum.

The pathologic report showed the diverticulum to be lined partly by intestinal mucosa and partly by gastric mucosa. At the junction of the two was a peptic ulcer, 8 mm. in diameter, which invaded the submucosa and partly the muscularis and was bordered by a wide zone of inflammatory tissue.

The patient had an uneventful postoperative course with stabilization of blood pressure at 132/100, and was discharged six days after admission.

COMMENTS

Meckel's diverticulum is not commonly encountered by the proctologist. However, when one considers that it occurs in 2 per cent of the population [*1*] and gives symptoms in from 15 to 20 per cent of those possessing it [*2,7,8*], it should be considered in the differential diagnosis of unexplained rectal bleeding, especially in a child. It is the most frequently occurring developmental anomaly of the gastrointestinal tract and results from the failure of the intestine to lose its connection with the yolk sac, normally occurring in the sixth to seventh embryonic week [*3*]. Developmentally, failure to lose this connection may lead to the diverticulum or a persistent omphalomesenteric duct or any combination of conditions between the two.

It occurs on the antimesenteric border of the ileum, generally from 18 to 30 inches above the ileocecal valve, but has been found, according to Moses, in all parts of the gastrointestinal tract from the stomach to the rectum [*2*]. It has a diameter generally less than the ileum, although giant forms may exist, and may vary in length from ½ to 3 inches [*1*].

One of the most interesting features of Meckel's diverticulum is the presence of heterotopic tissue in approximately 35 per cent of the cases [*2,4*]. Gastric mucosa is most commonly encountered, although pancreatic, duodenal, colonic, biliary and jejunal elements are occasionally seen.

The diverticulum is subject to important pathologic changes such as inflammation, peptic ulcer, intussusception, perforation, volvulus, Littre's hernia and fistula formation. Although it may manifest itself at any age, almost half of the patients in Gross' series were under the age of two when admitted to the hospital.

The anomaly has rarely been demonstrated roentgenologically despite its occurrence in 2 per cent of the population [*4*].

Hemorrhage is the chief complication of Meckel's diverticulum and may be due to peptic ulceration, inflammation, erosion and, rarely, neoplasm [*6,7*]. It is most frequently due to peptic ulcer, presumably from digestion of the neighboring mucosa by the pepsin and hydrochloride secreted by the aberrant gastric tissue. This complication is two to five times as common in boys as it is in girls; 74 per cent of hemorrhages occur in children under the age of fifteen, but they have been encountered at operation in persons ranging in age from two weeks to seventy-seven years [*2*]. In Gross' series, 80 per cent of all instances of hemorrhage occurred in children under the age of two [*1*].

In children this condition is manifested by the sudden passage of a copious black stool, without previous symptoms, and a subsequent bright red or brick-colored stool. Bleeding is massive and the red blood cell count may drop to 1.5 or 2 million per cu. mm. There may be no pain or only mild discomfort, generally in the periumbilical region. Bockus [*4*] remarks on the periodicity of severe internal bleeding associated with this anomaly and believes the diagnosis is strengthened by a family history of other congenital anomalies.

The differential diagnosis includes intussusception, rectal and colonic polyps, hemorrhoids, fissures, peptic ulcer and hemorrhagic diathesis. In intussusception there is a more agonizing crampy abdominal pain and other signs of obstruction such as vomiting, plus the currant jelly stool. However, Meckel's diverticulum may imitate intussusception. Rectal and colonic polyps are less likely to cause severe bleeding. Most frequently the blood occurs in streaks in mucus, especially after bowel movements. The diagnosis may be confirmed by sigmoidoscopy and barium enema. Hemorrhoids and fissures may be detected proctoscopically.

Peptic ulcer may be suggested by the history, the patient's age, epigastric pain, response to alkalis and barium studies. The hemorrhagic diathesis may be suggested by the history, and blood studies should confirm the diagnosis.

The patient reported herein had an almost typical history of hemorrhage from a Meckel's diverticulum, especially so with the episode of undiagnosed rectal bleeding occurring at the age of twenty months. It is a matter of conjecture as to whether or not intermittent occult bleeding caused the anemia and contributed toward the apparent mental retardation.

The treatment is transfusion and early surgery in the manner advocated by Ladd and Gross.

SUMMARY

A case of massive rectal bleeding in a fifteen year old boy is presented. The history, physical findings and course of the illness were typical of hemorrhage from a Meckel's diverticulum and the diagnosis was confirmed at surgery. Some salient facts relative to Meckel's diverticulum are reviewed to assist the proctologist in establishing an early diagnosis.

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Precancerous Dermatoses and Intraepidermal Cancer of the Anal Region

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THERE is general dissatisfaction with the poor results of present day therapy for advanced malignancy of the anal region. While squamous cell cancer of the anus can arise *de novo*, a certain group of anal malignancies may be preceded by precancerous foci. If more of the precancerous lesions and early malignant changes which occur in the anal region could be identified and eradicated, better therapeutic results could undoubtedly be obtained.

Prior to 1942, rectal carcinoid tumors were rarely reported. Since then, owing to an increasing knowledge of pathology and a greater clinical awareness of this condition, the number of such lesions which have been discovered has steadily risen [*15*]. However, there is still scant mention in the literature of the uncommon precancerous and intraepidermal malignant anal lesions. It is the purpose of this paper to discuss, not advanced tumors of the anal region, but rather these precancerous and early malignant anal dermatoses which if neglected can progress to a more malignant disease.

Of these anal dermatoses, leukoplakia, pigmented nevi and radiodermatitis belong in a category long recognized as possessing carcinogenic tendencies. These lesions are designated as precancerous because of the high incidence of cancer developing in their presence [*8,9,23*]. If these lesions are not eradicated in their precancerous phase, intraepithelial malignant transformation may ensue. The final stage in their malignant evolution is an invasive and metastatic tumor. Bowen's disease and Paget's disease, however, are considered to be early intraepidermal cancers from the outset and therefore are not designated as precancerous lesions [*14*].

Confusion and controversy still exist as to the exact connection between chronic benign inflammatory lesions and subsequent malignancies developing about the anus. An increasing recognition of the possibility of malignant change in such lesions together with a more painstaking pathologic study of excised chronic inflammatory tissues would not only advance our knowledge but also unquestionably improve results in the treatment of anal cancer.

PRECANCEROUS ANAL LESIONS

Leukoplakia. This disease represents a senile keratosis of mucous membranes. It is most commonly seen in the male oral cavity and somewhat less frequently on the vulva. Perianal extensions from primary vulvar leukoplakias are occasionally mentioned in the texts and literature, but a primary lesion arising in the anal canal is rarely reported [*5,13*]. Chronic inflammatory or irritative trauma acting on a defective anal epithelium is probably the most important etiologic factor [*23*].

Certain confusions still exist concerning leukoplakia, kraurosis, lichen sclerosus et atrophicans and other dermatoses found in the vulvar and anal regions [*1,28*]. This is mainly due to conflicting concepts on etiology, pathology and terminology advanced by the various specialties which deal with disease in this location [*28*]. Kraurosis ani is a progressive, senile, atrophic and sclerosing epithelial lesion. While it is without malignant connotations, it may sometimes resemble anal leukoplakia clinically [*24,28*]. However, leukoplakia, a chronic inflammatory hypertrophic epithelial lesion, can be engrafted upon a kraurosis, and this will alter the prognosis adversely.

Clinically, the presence of slightly elevated, marginated, grayish white keratinized patches on the anoderm or transitional anal canal

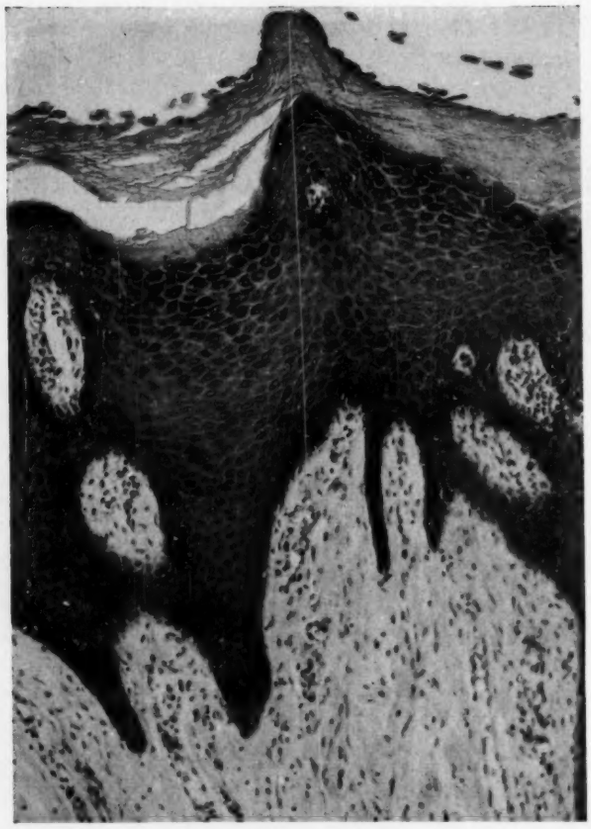

FIG. 1. Leukoplakia of the anal canal. Section of anoderm showing hyperkeratosis and acanthosis with an orderly hyperplasia of the malpighian cells and a round cell infiltrate in the dermis. Original magnification × 100.

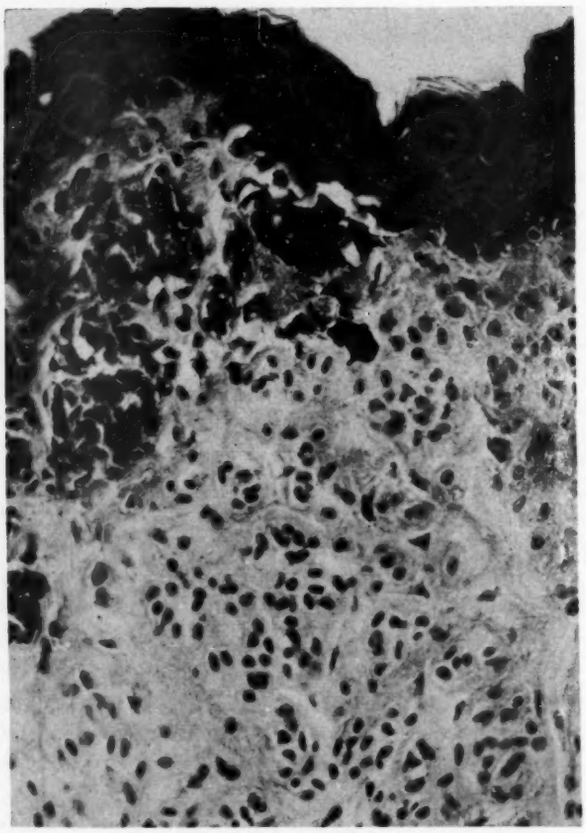

FIG. 2. Pigmented intradermal nevus of the anus. Section showing intradermal nevus cell nests contiguous with the basal cell layer and pigmented melanocytic cells. Original magnification × 210.

"mucosa" is suggestive of leukoplakia. Biopsy is always necessary for confirmation and differential diagnosis as well as to classify the stage of leukoplakia for proper treatment [*13*]. This lesion is definitely one of the precancerous dermatoses because of its natural evolution, if untreated, to squamous cell cancer. One-third of the oral leukoplakic lesions and about one-fourth of vulvar leukoplakias will undergo definite malignant transformation [*18,21–23*]. The importance of early recognition and appropriate treatment for this dermatosis is therefore emphasized.

Microscopically, anal leukoplakia is a chronic inflammatory hypertrophy of the epithelium showing marked hyperkeratosis and acanthosis of the epidermal layer with orderly hyperplasia of the rete cells. (Fig. 1.) The papillary portion of the corium has a marked chronic inflammatory lymphocytic infiltrate [*13*]. The precancerous stage of the leukoplakic lesion has advanced to an intraepidermal malignancy when anaplastic malignant dyskeratoses are found in the epidermal layer. The final phase of invasion and metastasis will develop from the untreated intraepidermal lesion.

Local excision of the leukoplakic anal lesion should suffice in the precancerous and intraepidermal phases. An anoplastic procedure with sliding or pedicle skin grafts may sometimes be necessary for large patches [*10*]. Microscopic evidence of invasion with possible metastases demands radical operative treatment and inguinal gland dissection. Radiation therapy has proved impractical and often ineffectual for leukoplakia in the anal region.

Pigmented Nevi or Common Moles. These may arise wherever the pigment-producing melanocytic cells are found, and these lesions do occur in the anal region. The term "benign melanoma" is sometimes loosely applied to this dermatosis. The nevus lesion is composed

basically of intradermal groups or nests of characteristic nevus cells with uniform hyperchromatic oval or cuboidal nuclei. (Fig. 2.) The origin of the nevus cell is still a controversial subject.

An intradermal or resting nevus is considered to be benign, while the junctional and compound types showing activity at the dermoepidermal junction are potentially malignant and can change into malignant melanomas [*7,29,31*]. Unfortunately, the type of nevus cannot always be determined by the clinical appearance alone [*29*]. Any pigmented nevus may have malignant potentialities if it is in a site that is subjected to repeated traumatic irritations. The amelanotic tumor has the same cancerous significance as the pigmented varieties.

The malignant transformation of a nevus is usually indicated clinically by a sudden increase in size, contour or pigmentation, by the development of an inflammatory border, or by ulceration, crusting and bleeding [*7*]. The microscopic criteria for malignant transformation are invasion of dermal nevus cells into the epidermal layer, multiple mitoses, ulcerative changes and a marked inflammatory infiltrate. Atypicality of the tumor cells is often relative. A malignant melanoma has always been an exceptionally treacherous lesion to deal with.

Any mole found in a location subjected to chronic irritative trauma should be excised while it is still in the precancerous state [*7,31*]. In the case of the premalignant pigmented tumor of the anal region, the best method of treatment is a wide and sufficiently deep excision, followed by careful microscopic examination of the entire lesion for possible malignant transformation. Nevi and melanomas are very radioresistant; electrofulguration is often incomplete and therefore risky.

Chronic Inflammatory Lesions. These lesions, when located about the anus, have been the source of considerable debate as to their carcinogenic potentialities. Some observers have stated that any malignancy associated with a benign inflammatory lesion in this location is merely coincidental [*2,16*]. Others claim that malignancy is prone to develop on any tissue damaged by prolonged inflammatory trauma. The increasing number of recent case reports of cancer originating in chronic sinuses, fistulas, lymphogranuloma venereum, fissures and hemorrhoids seems to substantiate this view [*3,6,17,20,26,30*].

Rosser has consistently maintained that cancer can arise from a chronic inflammatory anal lesion, and has reported twenty-one such cases [*26,27*]. After careful microscopic study following operation, Tucker and Hellwig found unsuspected early malignant changes in 1.9 per cent of 951 supposedly benign anorectal lesions [*33*]. Buie and Brust, in a report on fifty-one cases of malignant anal lesions, found a preceding benign lesion in thirty-four [*4*]. Smith collected a series of 107 cases of anal malignancy developing in association with supposedly benign anal disease [*31*].

In our opinion, cancer is very prone to develop in unsound tissues of the anal region which have been weakened by the chronic infection and irritation found in long-standing fistulas, lymphopathies, cicatrices and similar conditions. The type of resulting neoplastic lesion will vary with the site of origin in the anal canal and the proximity to the crypt line and rectal mucosa. Squamous cell cancer is the most common malignancy, but mucinous, columnar cell and the rare basal cell epithelioma have also been reported in the anal region.

In view of the steadily increasing amount of evidence, we believe that all chronic indurative inflammatory lesions should be excised and carefully examined microscopically. Malignant anal disease can develop so insidiously that in its incipiency it may be very difficult to distinguish from benign dermatosis. The fine distinction between an early stage of anal cancer and chronic inflammatory hyperplasia can often be an arbitrary one [*8*]. Therefore, when a biopsy reveals inflammatory hyperplasia, a careful search should be made for early neoplasia.

Radiodermatitis. This precancerous lesion has exhibited malignant transformation in a sizable percentage of cases [*2,23*]. Montgomery claims that malignant changes occur in 19 per cent of cases of radiation dermatoses. The change begins as an *in situ* lesion showing intraepidermal anaplasia not unlike Bowen's epithelioma [*23*]. Biopsy is always necessary to identify the changes and to indicate the proper surgical approach. Fortunately, improved radiation technics and more discriminating use of x-ray therapy in the treatment of anal diseases are minimizing the incidence of this type of lesion.

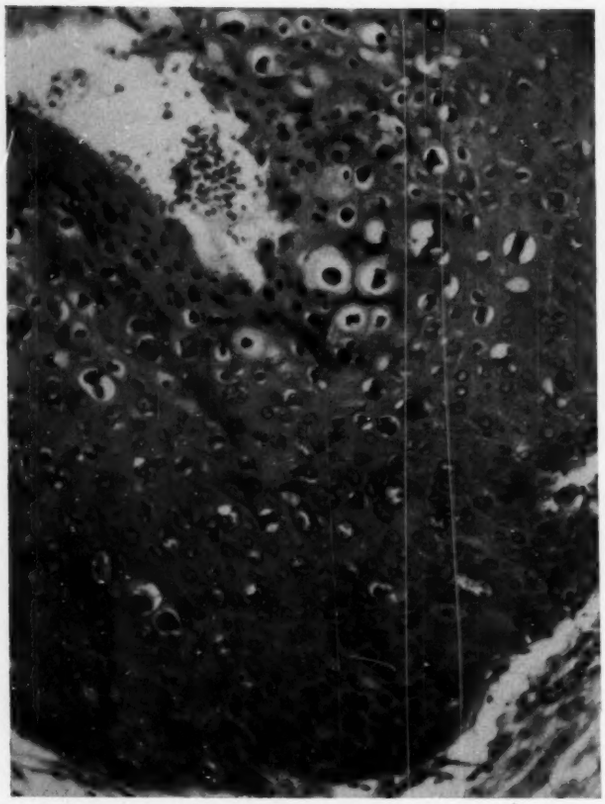

FIG. 3. Bowen's epithelioma of the perianal region. Section showing parakeratosis and disorderly acanthotic hyperplasia of the rete cells, with haloed Bowen cells and malignant dyskeratoses. × 160.

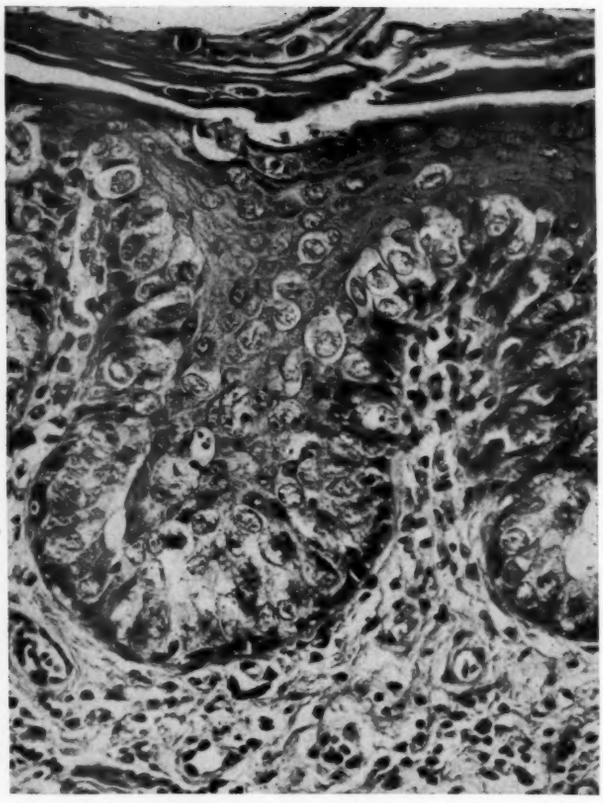

FIG. 4. Extramammary Paget's disease. Section showing hyperkeratosis, disorderly acanthotic changes in the malpighian layer and vacuolated pagetoid cells with intercellular edema. The basal cell layer is intact. × 210.

INTRAEPIDERMAL ANAL CANCER

Bowen's Disease. In the perianal region this is a rare and slowly maturing intraepidermal squamous cell cancer from the outset [*10,14,33*]. The clinical lesion is not characteristic or diagnostic in itself and may mimic a number of benign lesions, such as papilloma, condyloma, eczema, psoriasis and others. It eventually appears as a crusted, oozing, granulomatous area. This malignant dermatosis has a tendency toward chronicity over a period of years before any invasive or metastatic qualities develop. An excision biopsy is always advisable for diagnosis, for evaluation of activity and as a guide to adequate surgical treatment [*14*].

Histologically, the perianal epidermal lesion shows hyperkeratosis, parakeratosis and marked acanthosis. The malpighian cells have a disorderly type of hyperplasia with atypism and malignant dyskeratotic cells. (Fig. 3.) Characteristic giant type Bowen cells with haloed "clumped" or multiple nuclei are usually present in the malpighian layer [*14*]. The intercellular bridges of the prickly cell layer are retained in this lesion. Occasionally, epithelial pearls may be seen in the epidermal layer. The subjacent dermis always has a marked chronic inflammatory infiltrate.

In the early intraepidermal stage, which can be classified as an epithelioma *in situ*, Broder's grade 0 or ½, wide local excision of the tumor will be sufficient. An anoplastic procedure, as suggested by Fitzsimmons, may be required for more extensive denudation [*10*]. If the basal cell layer of the epidermis is disrupted and dermal invasion is seen, the likelihood of metastases is great and radical surgical treatment will be necessary as with any advanced cancer. Fortunately, the invasive lesion occurs rather infrequently.

Paget's Disease. This lesion of extramammary origin is a rare epithelioma which may be found where the apocrine glands are abundant. The mammary gland is considered to be a modi-

fied type of apocrine gland [*19*]. The usual sites of the extramammary lesions are near the axillas, genitalia and on occasion the perianal region. Less than a dozen authenticated cases have been reported in the perianal location [*12,25*]. Some investigators believe that Paget's disease is a primary carcinoma of the apocrine glands, with intraepidermal extensions causing the skin lesion. Others, including Montgomery, support a multicentric theory of origin and consider the epidermal lesion to be an independent one [*19*].

Clinically, the lesion is characterized by spreading, slightly indurated or infiltrated inflammatory areas of dusky erythematous skin showing scaling, oozing and crusting. This condition may resemble chronic neurodermatitis or eczema, and perianal itching can be very pronounced. A diagnostic biopsy should always be taken of any chronic inflammatory lesion of this type found in the perianal region [*12*].

Histologically, the epidermis shows hyperkeratosis and disorderly acanthotic changes with scattered characteristic pagetoid cells. The haloed Paget cells have large, round, sharply defined, single, pale-staining nuclei surrounded by a faint retracted cytoplasm and are devoid of prickles [*19*]. These cells are sometimes concentrated near the basal cell layer and their vacuolated appearance is caused by marked intercellular edema. (Fig. 4.) The corium always shows a chronic inflammatory round and plasma cell infiltrate. The distinction between Bowen's and Paget's epithelioma is sometimes a difficult one to make, both clinically and microscopically. However, the hyperchromatic "clumped" multinucleated giant cells with prickles and the individual cell keratinization seen in Bowen's epithelioma are absent in Paget's disease.

If there is no evidence of invasion after a careful biopsy study, wide local excision should be performed. By its very location in the perianal region, the lesion will tend toward inguinal gland metastases and spread to other parts via the lymphatics. If such evidence is found, a radical surgical approach will be necessary and only a guarded prognosis can be given. The malignant potentialities of Paget's disease surpass those of Bowen's epithelioma.

SUMMARY AND CONCLUSIONS

Although there is little mention in the literature of the uncommon precancerous and intraepithelial malignant anal diseases, such lesions unquestionably have a bearing on some of the later advanced lethal malignancies of this region. An increasing awareness of these rather unusual lesions and the possibility of early malignant changes in some of the more common chronic inflammatory conditions would undoubtedly contribute to a reduction in the high mortality rate of the later advanced anal malignancies.

Perhaps like the dermatologists, we should make more frequent use of biopsy study of the bizarre clinical anal lesions seen in leukoplakia, Bowen's and Paget's disease, and the other dermatoses that have a malignant portent. A more exacting study of the pathology, rather than a "routine examination," of the excised chronic inflammatory lesions which are common about the anus is also desirable.

The precancerous dermatoses, intraepidermal lesions and malignant changes in chronic inflammatory conditions about the anus should be recognized early and treated before the evolutionary cycle to an invasive malignancy is completed. Excision of the lesion *in toto* followed by careful microscopic study is preferable to radiation therapy or destruction by electrosurgical procedures.

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Prothrombin Time during the Postoperative Period

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IN discussing prothrombin time it is necessary to have a clear understanding of the clotting mechanism. Today, blood coagulation, as many of us see it, is a confusing mass of terms and diagrams with each authority having his own synonyms. During the last fifteen years a great deal of progress has been made in the study of blood coagulation as a separate branch of hematology. For instance, new clotting factors have been identified and only recently has it been shown that the following refer to a single protein clotting factor or its modified form in the serum: Ac globulin, XXII; stable factor, XXIII; plasma co-factor, XXIV; factor V, XXV; PPCF, XXVI.

Recently the existence of factor VII has been suggested and DeNicola believes that this factor varies more and earlier during anticoagulation therapy than the modification of prothrombin. Increased factor VII activity has also been observed in thromboembolic disease.

In Figure 1A to C we have broken the coagulation process down to perhaps a much too simplified state and use the more familiar terms, borrowing from Quick, Stefanini [1], DeNicola [2] and Seegers [3]. Stefanini in a recent article [4] reviewed all the recent conceptions of the mechanism of blood clotting. He includes in his paper the theories of Owren [6], Quick, Seegers, Tocantis and Stefanini [7] as compiled by Dr. Everret C. Albritton, editor of the Handbook of Biological Data. Salibi [5] has also written an excellent review.

Nearly all men agree that agglutination of platelets represents the initial step. It liberates thromboplastinoginase, which reacts with plasma thromboplastinogen to form thromboplastin. The platelets also supply a vasoconstrictor which causes a prolonged localized state of vasoconstriction, reducing blood loss and helping the fibrin clot to anchor. The thromboplastin, calcium, plasma labile factor (Ac globulin) and plasma stable factor

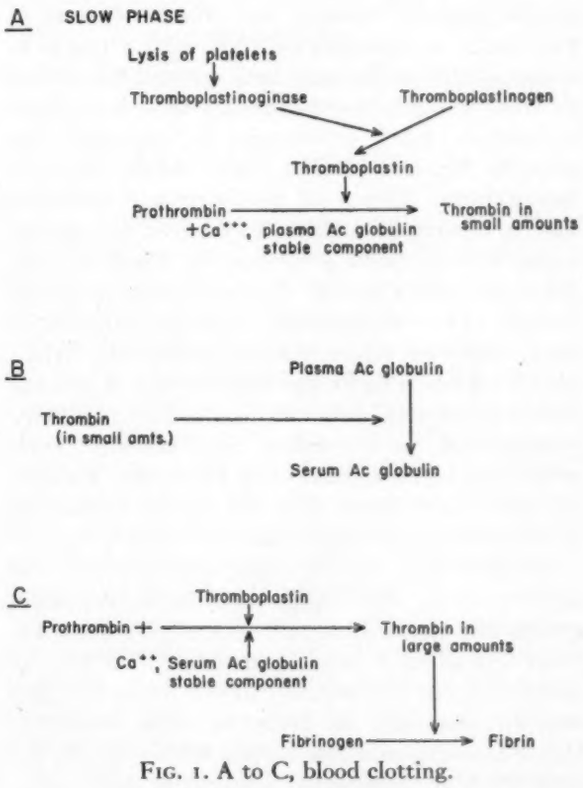

FIG. 1. A to C, blood clotting.

form small amounts of thrombin or what is known as the slow phase of Stefanini. (Fig. 1A.)

Thrombin then activates plasma Ac globulin to serum Ac globulin, starting the accelerated phase. Prothrombin, calcium, stable component and serum Ac globulin interact to form thrombin with increasing speed. Enough throm-

bin is formed to activate fibrinogen to fibrin. Thrombin also causes clumping and disintegration of platelets, thus continuing the cycle. (Fig. 1B and C.)

The process of coagulation is an unstable balance with negative and positive factors. Antithromboplastin and antithrombin are present with perhaps many more as yet unidentified factors.

Fibrin, playing an active role, absorbs thrombin on its surface and thereby checks rapid formation of this enzyme. It also lyses platelets. The major dispute still rages as to whether the reactions are enzymatic or stoichiometric.

According to Quick [8] hemorrhagic disease can be roughly classified into two main groups: hypothromboplastinemias and hypoprothrombinemias.

Quick [35,36] states that prothrombin is synthetized by an enzyme which consists of two parts, an apoenzyme (AE) and vitamin K which serves as the prosthetic group. According to this, hypoprothrombinemia falls into three groups: (1) Lack of vitamin K; organism has enough AE but cannot form AEK, that is, hemorrhagic disease of newborn and bleeding due to obstructive jaundice; cured by giving vitamin K in small amounts. (2) Lack of vitamin by antivitamin K; compounds AED formed (D = dicumarol); therapy consists of large doses of vitamin K to replace D, AED plus K, AEK plus D. (3) Apoenzyme is lacking due to congenital defect or liver injury; therapy consists of prothrombin replacement with plasma or blood transfusion. However, Warren believes that three day old blood is low in prothrombin and high in accelerators.

Rhoads [37] writes that prothrombin is destroyed in the lung. Available evidence points to a rapid disappearance of prothrombin from circulation and concurrent formation mainly, if not exclusively, in the liver. He also showed that not all patients with hypoprothrombinemia could be helped with vitamin K, only those patients with vitamin K deficiency.

Many authors have reported on prothrombin levels in the postoperative state [9–15,17,19]. Most of them found a lowered prothrombin activity in an appreciable number of their cases. There was, however, no consistent modification of the normal levels. Changes in the opposite direction were also observed by some of the investigators [9,13] especially in cases of malignant disease. Nasilowski [11] found the most marked lowering in patients who had lowered prothrombin activity prior to surgery.

Quick found prolonged prothrombin time in the cord and infant's blood if the mother did not receive vitamin K.

Shapiro [10] and Warren [19] found a decrease in platelet count during the early postoperative period also.

All available information on postoperative changes in the clotting mechanism has been summarized recently by Warren [21].

A rather interesting finding of Steinberger [23] was the increased thrombin in thrombotic states including thrombosed hemorrhoids, coronary occlusion, postoperative thrombosis, but also in biliary disease without jaundice.

Olwin [24] reported a rise in Ac globulin in cases of thromboembolic disease. It was not clear if this was cause or effect.

Cook, Pearl and Harris [25] in a clinical study of 165 non-jaundiced patients showed a high incidence of unsuspected low blood prothrombin content. It was suggested that there was a relationship of low levels of blood prothrombin to postoperative complications such as hemorrhage and deficient wound healing. Of the 165 patients twenty-one or 13 per cent had a prothrombin on admission under 50 per cent. Ten of these or 67 per cent had complications. In 146 patients with prothrombin time over 50 per cent, four or 3 per cent had complications. Experiments on rats gave added evidence that hypoprothrombinemia may contribute to impaired wound healing.

Levy-Solal and Argent [26] concluded that physiologic hypercoagulability of blood does not play an important part in pathogenesis of postpartum thrombophlebitis.

Low prothrombin time has also been reported in myocardial infarction. Peery et al. [27] in a series of 136 cases of myocardial infarction reported initial prothrombin time before dicumarol of less than 50 per cent in sixty-one cases (45 per cent). This was determined prothrombin time using the dilute (12.5 per cent) plasma prothrombin test. These patients with myocardial infarction had a mean prothrombin time of 32.29 seconds as compared to that in normal subjects of 38.6 seconds. This was considered significant. Since the surgical patient is subjected to great stress during surgery, it was thought that perhaps patients receiving

ACTH and cortisone therapy would give a similar picture.

Beaumont [29] found hypercoagulability almost always in cases of myocardial infarction during the initial twenty-four to forty-eight hours. On the second or third day spontaneous secondary hypocoagulability occurs as shown by tests and lasts about seven days. Starting about the eighth day hypercoagulability recurs. Beaumont suggests that after initial heparin, no anticoagulants be given unless frequent tests show increasing clotting. Similar stages of hypercoagulability were found in pulmonary and cerebral embolism.

According to Cosgriff, Diefenbach and Vogt [30] eight of ten patients receiving ACTH or cortisone showed considerable shortening of venous clotting time. The heparin retarded venous clotting time was decreased in four of six patients. These authors state that there is no consistent change to a state of hyper- or hypoprothrombinism. However, patients receiving ACTH or cortisone are unusually sensitive to dicumarol.

Cosgriff [31] believes that thromboembolic phenomena are one of the serious complications of the hyperadrenal state.

Napolitano et al. [32] treated patients who had phlebothrombosis or thrombophlebitis with ACTH and observed remarkable improvement. During their study these authors showed that prothrombin time was prolonged and prothrombin level reduced. Protamine level at the same time increased. They felt that protamine increase was due to release of heparin from mast cells under stress.

Napolitano et al. put forth the possibility that epinephrine released under stress acts as a catalyst to alter the circulating profibrinolysin into active enzyme, fibrinolysin. This later agent has the capacity of inactivating the prothrombin and fibrinogen and lysing the fibrin clot.

FINDINGS

In our study, using the one-stage prothrombin test as described previously, both preoperative and postoperative prothrombin times were taken in 104 unselected patients from our private service. The types of cases are as follows: colectomy, thirty-two; hysterectomy, eighteen; gastrectomy, twenty-two; cholecystectomy, nine; resection of small bowel, six; abdominoperineal, five; exploration of common duct, four; miscellaneous (including two radical mastectomies), eight.

Prothrombin times were taken one day preoperatively and on the first, second and third postoperative day routinely. Additional tests were made in cases of complications and very marked and prolonged drops in the prothrombin time.

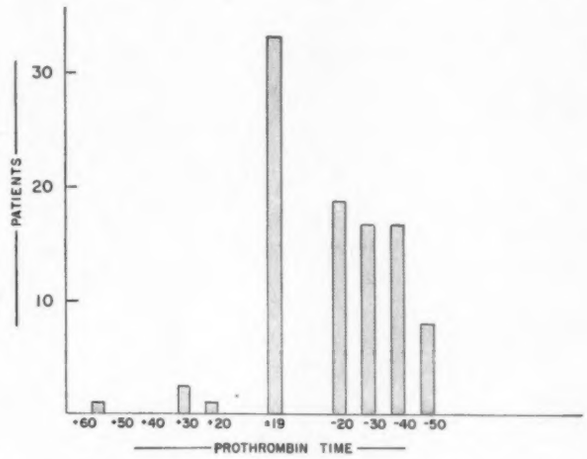

FIG. 2. Prothrombin time—percentage change. Postoperative: preoperative.

The first surprising observation was that only 74.6 per cent of the patients had prothrombin time of 70 per cent or over, which we arbitrarily considered as normal.

In the postoperative period the postoperative to preoperative percentage change is shown in Figure 2. Thirty-four patients had 19 per cent; nineteen had 20 to 30 per cent; nineteen had 30 to 40 per cent; eighteen had 40 to 50 per cent and eight had 50 per cent or greater drop. In four patients the postoperative prothrombin was higher than preoperative. None of the latter had evidence of phlebitis.

In these one hundred four cases there were six complications; there were four cases of phlebitis, one case of evisceration following vagotomy and one case of duodenal stump leakage following gastrectomy.

In forty-four of these patients eosinophil counts were taken. Thirty-eight were good responses and six were poor. In two of the patients with complications eosinophil counts were made [44]; both responses were good.

In the thirty-two cases of colectomy 35 per cent of the patients had an admission prothrombin time of 60 per cent or below. However, the postoperative drop was not greater

than in the cases with normal prothrombin time. This finding is contrary to Nasilowski's [11].

Figure 3 illustrates the case that started the investigation. This patient had a subtotal gastric resection for duodenal ulcer. Phlebothrombosis and an embolus developed about fifty-four hours postoperatively and at that time the patient had a prothrombin time of 40 per cent. He was treated with heparin, and the prothrombin time during the following fourteen days varied between 21 and 50 per cent without his having received any dicumarol.

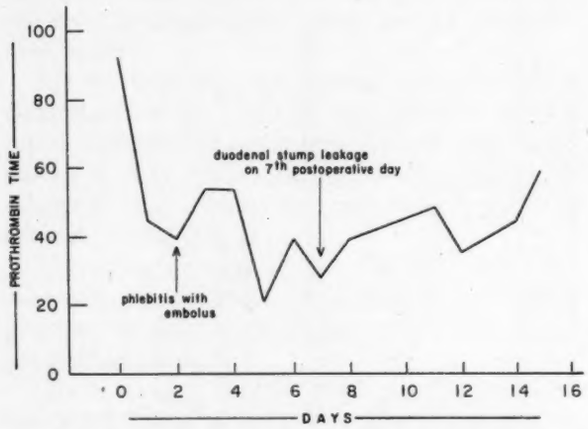

FIG. 3. Gastrectomy. Patient treated with heparin on second postoperative day. Eosinophil response good.

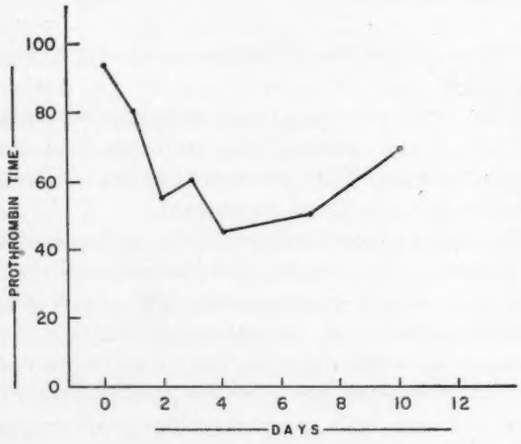

FIG. 5. Gastrectomy; duodenal stump leakage on twelfth day. Eosinophil response good.

Figure 4 illustrates a case in which evisceration and pyloric obstruction developed after vagotomy and pyloroplasty and the patient had a prothrombin time of 20 per cent. His prothrombin time became normal during the following week without vitamin K.

The third patient also had gastrectomy with complications, namely, duodenal stump leakage. This drop in prothrombin time postoperatively is shown in Figure 5.

Figure 6 shows prothrombin time in two patients with phlebitis following hysterectomy.

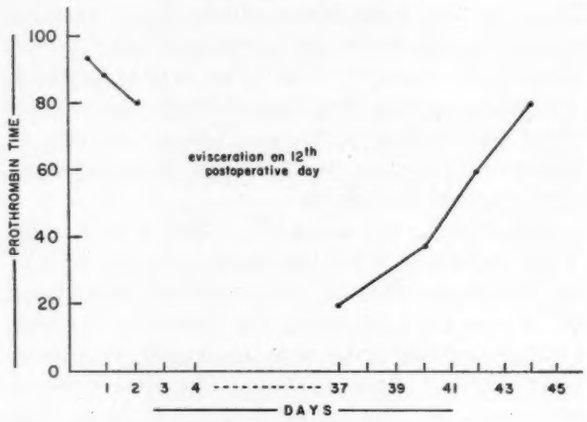

FIG. 4. Vagotomy and pyloroplasty with postoperative obstruction at pylorus.

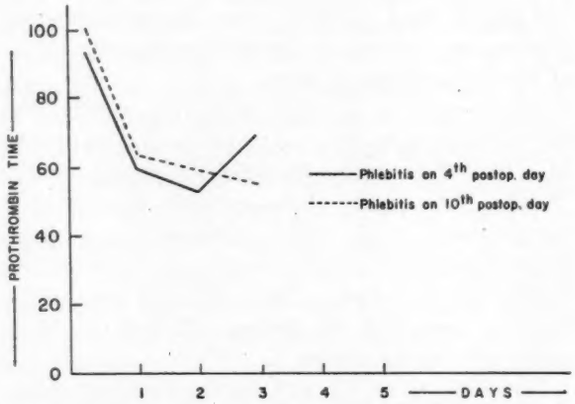

FIG. 6. Hysterectomy. Two patients with phlebitis.

The interesting observation to us was that these patients were among the group that had the greatest drop in prothrombin time.

Figures 7 and 8 show the excellent response to vitamin K of a low postoperative prothrombin time. One patient had jaundice (Fig. 7) and the other had an ileostomy and colectomy for ulcerative colitis. (Fig. 8.) This response does not necessarily suggest lack of vitamin K. The response to vitamin K could also be explained on the basis of a re-establishment of a disturbed enzymatic equation.

Figure 9 shows the marked sensitivity to dicumarol in a case of postoperative phlebitis.

This patient only needed 375 mg. of dicumarol to keep his prothrombin time at the desired level. In another case of severe post-traumatic ileofemoral thrombosis 300 mg. of dicumarol in the presence of a normal prothrombin time necessitated the administration of vitamin K because the prothrombin time dropped to dangerous levels.

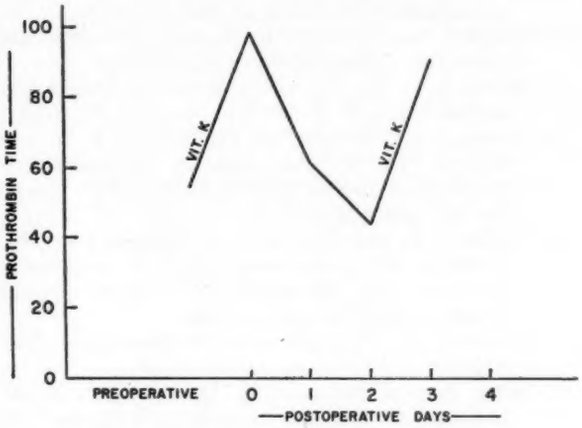

FIG. 7. Data on patient with jaundice.

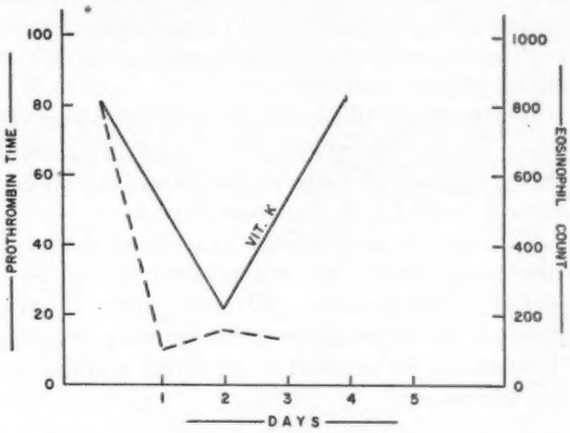

FIG. 8. Ileostomy and colectomy for ulcerative colitis. Preoperative therapy, antibiotics (oral and parenteral).

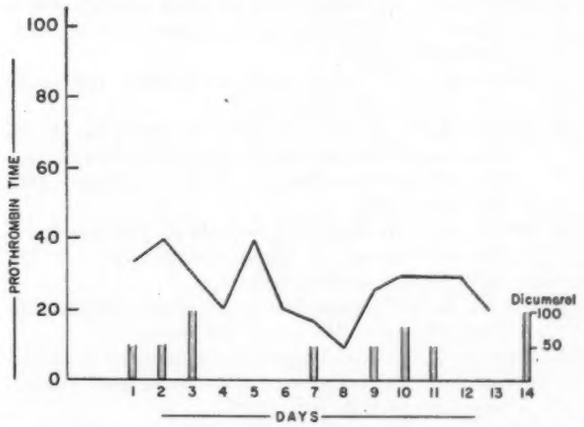

FIG. 9. Bilateral femoral vein ligation under local anesthesia for phlebitis with embolus four weeks after ventral herniorrhaphy.

CONCLUSIONS

1. Variations occur in normal prothrombin time values. A further study of healthy outpatients is being contemplated.

2. There seems to be no correlation between the eosinophil response and our complications. Marked drop in prothrombin time appeared to be present in these cases; however, the same degree of prolonged prothrombin time occurred in cases without complications.

3. We do not believe that prothrombin level drop postoperatively is due to loss of accelerator factors in every or any case, but that a multitude of variants are involved in every case.

4. Changes in prothrombin activity may be due to one of the following factors: (1) liver damage [*14*], (2) lack of supply of vitamin K, (3) lack of absorption of vitamin K [*16*], (4) increased use of vitamin K, (*5*) inadequate protein nutrition and (6) response to stress.

In our patients one or several of these factors play a part. For instance, some of these patients received oral antibiotics which changed intestinal flora and vitamin K absorption. Others have had no oral intake because of gastrointestinal suction. Because of diets some patients are probably not in optimal protein nutrition and vitamin K may be only barely in balance.

We believe that milk and cream diet does not supply optimum protein nutrition for the adult and that many complications following surgery for chronic peptic ulcer are due to impaired protein nutrition.

Four of our patients with marked drop in prothrombin time had clinical phlebitis. This drop may actually be a sign of increased clotting and increased use of available prothrombin. Warren and Belko [*20*] found increased consumption.

We think that in the presence of suggestive evidence of phlebitis a prolonged prothrombin time is corroborating evidence.

We believe that prothrombin time is only one factor in determining normal, decreased or increased coagulability of the blood.

We agree with Hogben [42] that prothrombin time does not afford certainty in the prediction of hemorrhage nor, we think, in the prediction of clotting.

Thus Sandrock [9] and Witz and Stuber [22], found hyperprothrombin time prior to the onset of clinical evidence of thrombosis whereas our findings and those of Ochsner [12] were just the opposite.

We therefore think a prolonged prothrombin time during the postoperative period should not be viewed with alarm nor should an urgent order for vitamin K be given.

We also do not believe that large doses of dicumarol should be ordered in cases of suspected postoperative phlebitis even in the presence of a normal prothrombin time because of the increased sensitivity to dicumarol during this period.

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Evaluation of the Various Methods to Manage Postoperative Pain and Morbidity Following Anorectal Surgery

A FIVE-YEAR STUDY

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THE management of pain and morbidity following anorectal surgery continues to be a subject of considerable importance at the present time. The knowledge that surgical treatment of anorectal diseases produces varying degrees of pain and occasionally prolonged suffering is accepted very deeply by patients and has been expounded as the principle factor in their reluctance to seek competent proctologic attention. In the past few years I have attempted to evaluate the various methods proposed to decrease pain and suffering following anorectal surgery by using an adequate number of patients in each series and comparing the results with a similar number of controls, the pertinent disease present and surgical technic being on a comparable basis.

It is generally recognized that the degree of postoperative pain is often obscure and difficult to evaluate because of the frequent interrelationship of functional and true organic elements in its pathogenesis. I am sure we have all been impressed with the frequency with which psychosomatic manifestations of extreme postoperative pain have their source in the fear of malignant disease. The variation in pain threshold and tolerance between various groups of individuals is extremely interesting. It was observed that in individuals with tendencies toward neurocirculatory asthenia, as compared to the average normal patient following anorectal surgery, the duration of the effects of low spinal anesthesia was one to two hours less and that it was necessary to administer sedation for relief of discomfort one to three hours more frequently in the former group than the latter. Clinically, it was of interest to note the decrease in pain sensitivity in the group of patients with arteriosclerosis and chronic syphilis. This may be explained on the basis of both central and peripheral nerve degeneration.

Pain following anorectal surgery is divided into three phases: (1) immediately following cessation of the anesthesia and persisting for a period of twenty-four hours; (2) with the first bowel movement; and (3) with the initial dilatation, digital or instrumental. The initial phase of pain is usually a result of direct surgical trauma while the second and third phases are bound up with muscle spasm, infection and to some extent with so-called mental tension, the result of apprehension and fear.

INTESTINAL STERILIZATION

Although the report of earlier investigators concerning the beneficial results of preoperative and postoperative sterilization was readily accepted and appreciated, it was decided to evaluate this form of adjunct therapy further.

A group of 150 consecutive patients were given a sulfa drug orally beginning three days preoperatively and continued to the fourteenth postoperative day. Thalamyd® was the drug of choice in all cases and 15 gr. every three hours for four doses were administered daily.

To determine the value of this drug in bowel sterilization, smears were taken from the lower rectum before the onset of administration and again from the sixth to the tenth postoperative day for comparison. The latter revealed a marked reduction in the gram-positive group

TABLE I

RESULTS WITH AND WITHOUT BOWEL STERILIZATION

	No. of Cases	Type of Anorectal Operations Performed	Bowel Preparation	Postoperative Sedation Required	Degree of Pain with Initial Defecation and Dilatation	Average Healing Time	Complications
Sulfa preparation	150	Hemorrhoidectomy, fistulectomy, fissurectomy	Thalamyd, 15 gr. every 3 hr. beginning 3 days preoperatively and continuing for fourteen days postoperatively	Demerol,® 100 mg. every 4 to 6 hr. during initial 24 hr. postoperatively (average, 3 doses); ½ gr. codeine sulphate as required 1st to 4th postoperative day	Mild to moderate	26 days	Prolonged soreness and tenesmus, 2 to 4%
Control group	150	Hemorrhoidectomy, fistulectomy, fissurectomy	None	Demerol, 100 mg. every 3 to 4 hr. on operative day (average, 5 to 6 doses); ½ gr. codeine sulphate every 4 hr. 1st to 4th postoperative day	Moderate to severe	34 days	Prolonged soreness and tenesmus, 14%

of organisms especially the staphylococcus and Streptococcus faecalis and hemolyticus. The reduction in the gram-negative coliform group was less marked but considered very significant.

A control group of 150 patients undergoing similar anorectal surgical procedures was used for comparison. The results are shown in Table I.

It was noted especially in the sulfa-treated group that there was a mild to moderate decrease in discomfort during the initial bowel movement and dilatation. Close observation revealed a reduction in the healing time. (Table I.)

INJECTION OF DELAYED ANESTHETIC SOLUTION

Because of the marked variation in opinion of the value of this type of treatment, utmost care was exercised to reach a decision as the results were produced. This investigative series included 1,200 cases. A sterile solution of zylcaine®, containing 15 mg. of procaine base, 60 mg. of butesin® and benzyl alcohol in peanut oil was used in all patients. Four hundred fifty patients with an equal number of controls were given bilateral pudendal nerve block. A series of three hundred patients were given unilateral pudendal nerve block. (Fig. 1.) Table II illustrates the results of this treatment.

The period of analgesia varied from seven to sixteen days. Following bilateral block, postoperative discomfort was controlled in 80 per cent by administering codeine twice daily. Twenty per cent required 100 mg. of demerol three times daily during the operative day and ½ gr. of codeine daily for the remaining four days. The percentage of urinary retention in men was reduced considerably as compared with a control group. Catheterization was necessary in only 8 per cent as compared to the usual 14 per cent in our experience. There is no explainable reason unless it be direct action on the nerve pathways to the bladder.

No incidence of fecal incontinence or infection was encountered.

A study was made to evaluate the beneficial results of perianal and intrasphincteric injections of anesthetic oil immediately preoperatively. Zylcaine oil suspension, 10 cc., was used in all patients. Five hundred control cases were used in this series. While there was slight to

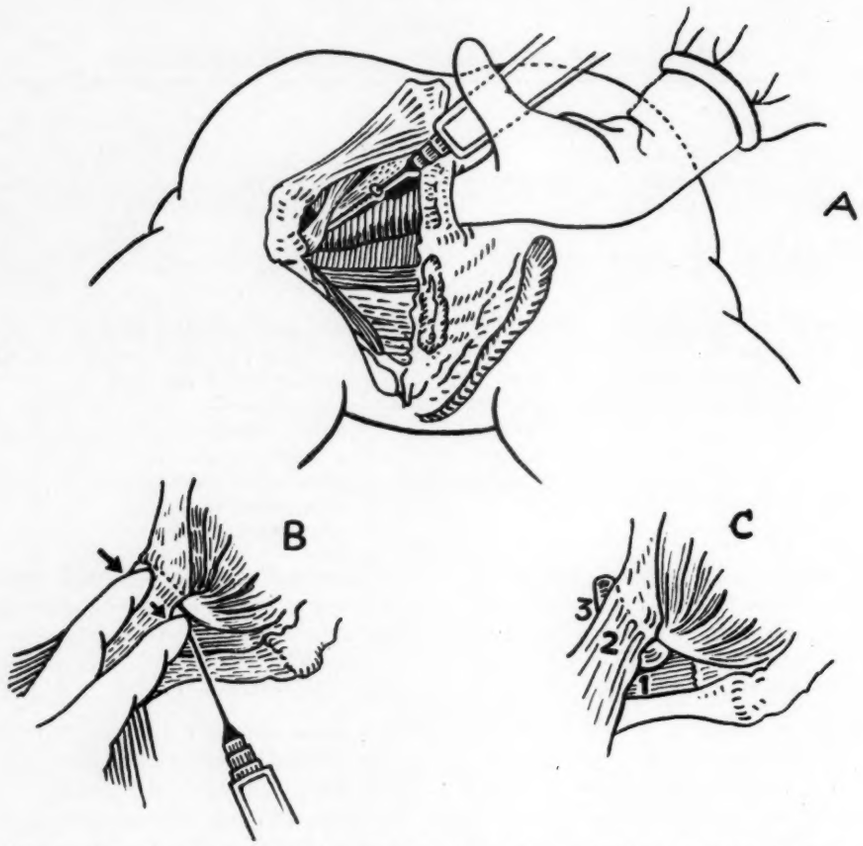

FIG. 1.—Technic of pudendal nerve block showing relation of ischial spine to points of injection.

TABLE II

RESULTS WITH PUDENDAL NERVE BLOCK

Procedure	No. of Cases	Postoperative Sedation Required for Relief of Pain	Catheterization Necessary	Nausea and Vomiting	Pain with Initial Defecation and Dilatation
Bilateral pudendal nerve block	450	Day of operation 80% relieved of pain by ½ gr. codeine every 6 hr.; 20% required 100 mg. demerol, 3 times a day; relief obtained 1st to 4th postoperative day by ½ gr. codeine daily	8%	10%	Mild, 90%; moderate, 10%
Unilateral pudendal nerve block	300	Day of operation 45% required ½ gr. codeine 3 times a day; 55% required 100 mg. demerol every 6 hr.; 1st to 4th postoperative day ½ gr. codeine was necessary every 12 hr.	12%	14%	Mild, 60%; moderate, 30%; marked, 10%
Control group	450	Day of operation 100 mg. demerol every 4 hr. was necessary (average, 5 doses in 24 hr.); 1st to 4th postoperative day ½ gr. codeine every 4 hr. was required for relief of pain	14%	30%	Moderate, 60%; severe, 40%

TABLE III

RESULTS WITH PERIANAL AND INTRASPHINCTERIC INJECTION OF OIL ANESTHETIC SUSPENSION (ZYLCAINE)

	No. of Cases	Amount of Solution Used	Postoperative Sedation Required for Relief	Degree of Pain	Period of Analgesia	Catheterization Necessary	Postoperative Complications
Perianal injection	350	10 cc., each side	Day of operation, 100 mg. demerol every 6 hr. (average, 3 injections in 24 hr.); 1st to 4th postoperative day, ½ gr. codeine twice daily	Mild to moderate burning on operative day; none to mild on 2nd and 3rd day	4 to 10 days	12%	Tenesmus and prolonged soreness, 1 to 3%
Intrasphincteric injection	150	10 cc., each side	Day of operation, 100 mg. demerol every 6 to 8 hr. (average, 2 to 3 injections in 24 hr.); 1st to 4th day ½ gr. codeine daily	Mild on operative day; none on 2nd and 3rd day	7 to 16 days	10%	Burning, soreness and sphincter spasm beginning 5 to 14 days postoperatively, 15%
Control group	500	None	Day of operation, 100 mg. demerol every 4 hr. (average 4 injections in 24 hr.); 1st to 4th postoperative day, ½ gr. codeine every 4 hr.	Severe, burning, throbbing on operative day; moderate soreness and muscle spasm on 1st to 4th day	None	14%	Prolonged soreness, spasm and tenesmus, 4 to 6%

moderate variation in the results it was concluded that this procedure is a very helpful adjunct in diminishing postoperative suffering. The results are shown in Table III.

It was found that discomfort and pain were definitely lessened from several days to a week. No infection or fecal incontinence was observed. It was established, however, that intrasphincteric injection produced reactive myositis in a large number of patients, beginning usually about the fifth postoperative day and continuing for as long as two weeks. This complication was manifested by a tender, spastic, external sphincter muscle. The patients complained almost continually of a burning soreness, and at times aching and throbbing. Although pus was not observed, the disease was assumed to be primarily a severe chemical myositis. Intensive aftercare was necessary following this complication as there was a marked tendency to sphincter fibrosis and contraction.

CONTINUOUS CAUDAL ANESTHESIA FOR FORTY-EIGHT HOURS

During the past two years I investigated the merit of continuous caudal anesthesia in a large series of cases. (Table IV.) The results were encouraging in that this procedure, in spite of its complexity, has a very useful indication in certain cases. I believe this technic is very helpful in the following instances: neurocirculatory asthenia; obese persons who react poorly to opiates; patients in whom opiates are contraindicated such as severe asthmatics, arrested addicts, some alcoholics and the like; following necessary early surgery with acute extensive anorectal inflammation.

No great difficulties or accidents have occurred. The procedure is simple and easily followed by a responsible graduate nurse. Relief is immediate and the effects of individual injections of 1 per cent xylocaine hydrochloride lasts for three to eight hours. The final injec-

tion is given one hour prior to the first dilatation and bowel movement, the latter produced by enema stimulation. It was found helpful to have the patient void before each injection.

In no case was there evidence of so-called "delayed or built-up" pain manifested following cessation of the anesthesia. The majority of patients exhibited some degree of apprehension and sensitivity as well as mild to moderate soreness in the operative area. However, satisfactory relief and control of these factors was obtained by routine use of warm sitz baths followed by hot witch hazel compresses together with aspirin-phenobarbital mixture, at times modified by ¼ to ½ gr. of codeine. Daily reassurance likewise played an important role as in all postoperative cases.

TABLE IV
APPRAISAL OF PROLONGED CAUDAL ANESTHESIA

Advantages	Disadvantages
Complete pain control	Extreme care in preventing tube contamination
Very cooperative patient	Responsible, reliable nursing care needed to administer solution with technic
Narcotics unnecessary	Delayed ambulation because of extremity unsteadiness
Absence of headache, nausea and vomiting	
Control of pain during first bowel movement and dilatation	
No toxic reaction	
No built-up pain following cessation of anesthesia	

THORAZINE

During the past year 25 mg. of thorazine have been administered immediately preoperatively and three times daily for three days postoperatively to more than 100 patients. No significant reduction of discomfort or decrease in the average amount of sedation usually required has been noted.

SUMMARY AND CONCLUSIONS

During a five-year period meticulous investigative work was conducted in a large group of patients, both private and nonprivate, to evaluate the beneficial results of various measures to control postoperative pain and morbidity following anorectal surgery.

Preoperative and postoperative bowel sterilization was shown to reduce the degree of postoperative discomfort to a satisfactory extent as well as to shorten the healing time.

Bilateral pudendal nerve block, using a light anesthetic oil suspension, produced the most favorable postoperative state. Unilateral nerve block was only slightly less effective.

Perianal and intrasphincteric injections given immediately preoperatively proved to be moderately helpful in reducing pain and discomfort in a larger percentage of cases.

Continuous caudal anesthesia for forty-eight hours postoperatively offers many favorable features among which are prompt alleviation of discomfort; absence of nausea and vomiting; a calm relaxed patient without fear of initial bowel movement; and ideal anesthetic routine for neurasthenic persons, controlled addicts, alcoholics and patients with certain complicated anorectal conditions requiring early surgery.

Thorazine was not found to be a helpful adjunct in the management of pain and discomfort following anorectal surgery.

Finally, a form of preoperative reassurance in eliminating fear and apprehension was found to be an invaluable aid in reducing the degree of postoperative tension.

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Traction Therapy, a Study of Resistance Forces

PRELIMINARY REPORT ON A NEW METHOD OF LUMBAR TRACTION

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THE purpose of this paper is to review current methods of traction therapy and to offer physical evidence that these procedures in most instances do not provide stretch to the spine or surrounding muscles.

Head halter traction to the cervical spine and lumbar spine by means of a pelvic belt or Buck's extension, are procedures commonly used for relief of pain caused by herniated discs and other mechanical lesions of the cervical and lumbar spines.

Hanging weights are employed, usually 5 or 6 pounds for the cervical spine and 20 to 30 pounds for the lumbar spine (10 to 15 pounds on each lower extremity).

The anticipated effects of these applications are: (1) to provide traction or stretch to the cervical or lumbar spine; (2) to produce a constant pull to overcome muscle spasm; and (3) to provide rest and immobilization.

Although this concept of traction therapy has been and still is accepted in many quarters, physical evidence offered herein reveals that in nearly all instances neither traction to the spinal segments nor stretch of the paraspinal muscle mass takes place. We believe that the group of patients who show satisfactory clinical improvement with hanging weight traction do so only because of rest and spontaneous subsidence of symptoms. In some patients the immobilization from these procedures appears to be of benefit.

* Deceased.

In mechanical lesions of the cervical spine associated with brachial plexus pain, many patients, even after weeks of hanging weight traction, show no improvement; some become worse. In this group the great majority of patients show satisfactory improvement by the simple expedient of using heavy traction force. Details of this study have been previously presented. These reports included the results of test traction, the x-ray findings noted during heavy traction and a description of a new motorized intermittent cervical traction apparatus.

In mechanical lesions of the lumbar spine with sciatic pain, the problem of traction is much more difficult than that in the cervical spine. Reasons for this are: (1) heavier structures both in the lumbar vertebral column and muscle mass; and (2) ineffective pull because of the greater surface traction resistance of the lower half of the body.

RESISTANCE OF BODY SEGMENTS TO TRACTION

Surface traction resistance is created by several factors: (1) the area, shape and manner of surface contact of the body or body segments upon the bed; (2) the weight of the body or body segments; and (3) the quality, contour and texture of the contacting surfaces.

When traction is applied to the lower extremities, the weight required to produce stretch will vary according to the level at which stretch force is desired. The higher we desire

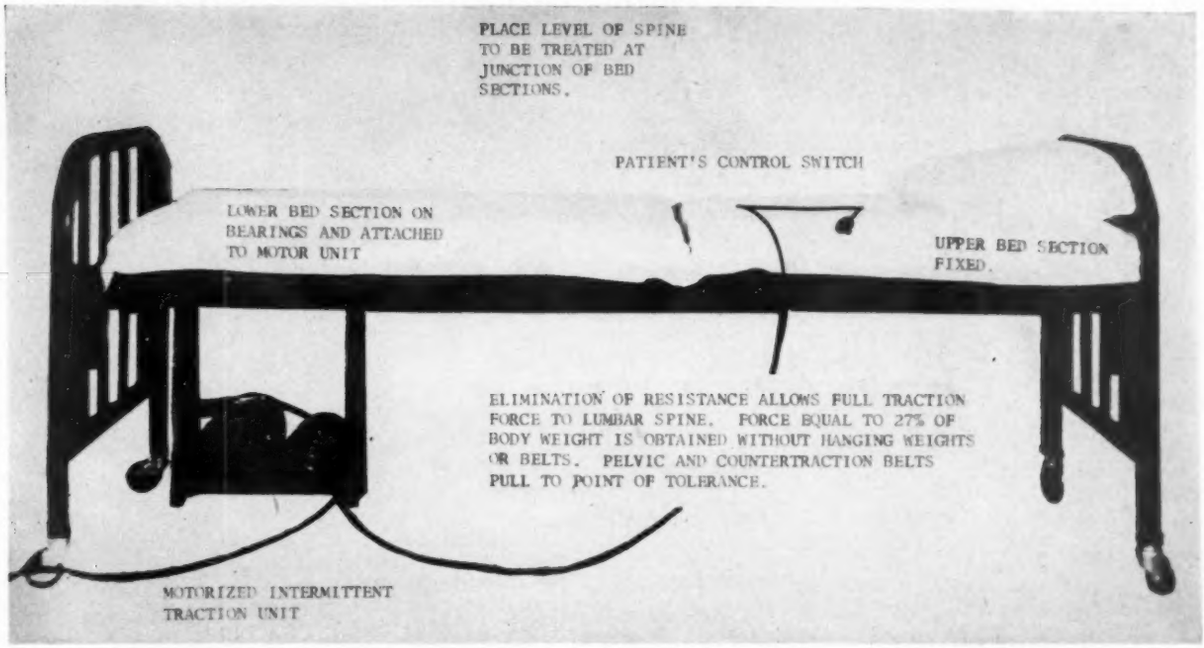

FIG. 1. Split traction bed, new apparatus for lumbar intermittent traction. A 180 pound patient, by lying on the bed without the use of hanging weights or belts, will obtain a pull of approximately 50 pounds in the lumbar spine. With belts, unlimited force can be obtained. Weights are not used. (From: JUDOVICH, B. D. Lumbar traction therapy—elimination of physical factors that prevent lumbar stretch. *J. A. M. A.*, 159: 549, 1955.)

to apply traction the more weight we must apply. For example, 10 pounds will cause some stretch at the knee but none at the hip joint; 20 pounds may cause some stretch in the hip, but none in the lumbar spine. This progressive requirement of weight as upper segments are reached is due to the combined surface traction resistance of the lower body segments.

Simply, the problem resolves itself to the following: A body is transversely sectioned through the lumbar spine at the level of L4–L5, the level, let us say, of a herniated disk. The lower half of the body is placed in bed and weights are applied. If the weights applied are not enough to move the entire lower body, then not enough force is being applied to create stretch in the lumbar spine, the force of the applied weights being completely neutralized by the traction resistance of the lower body segment. This would also prevent traction upon the paraspinal lumbar muscles.

In the cervical spine, the same conditions hold true. The head and neck segment was disarticulated at C6–C7 level, and placed upon the bed with 5 pounds of traction. This was insufficient to move the segment [6].

In an effort to eliminate resistance of the lower body segment and provide adequate stretch to the lumbar spine, a new traction bed was devised by the senior author. A bed is built in two sections: the upper section is fixed, the lower section is mobile upon roller bearings and is transported by a motorized intermittent traction unit. Each section has its mattress. With the sections closed, the patient is placed upon the bed in the supine position with the lower lumbar spine at the junction of the sections. The resistance of the lower body is no longer a factor since it is transported mechanically. The force exerted at the lower lumbar spine is equivalent to the countertraction value of the upper body segment. This is approximately 27 to 28 per cent of the total body weight [4]. This entire force is exerted at the bed split and is obtained merely by having the patient lie upon the bed without weight or belts, utilizing the countertraction value of the upper body segment. (Fig. 1.)

Table 1 lists the approximate values of traction forces exerted to the lower lumbar spine in this manner.

The values of these resistance factors have been previously reported [2,4–6], including the whole body (using cadavers and live subjects) with separate resistance factors for disarticu-

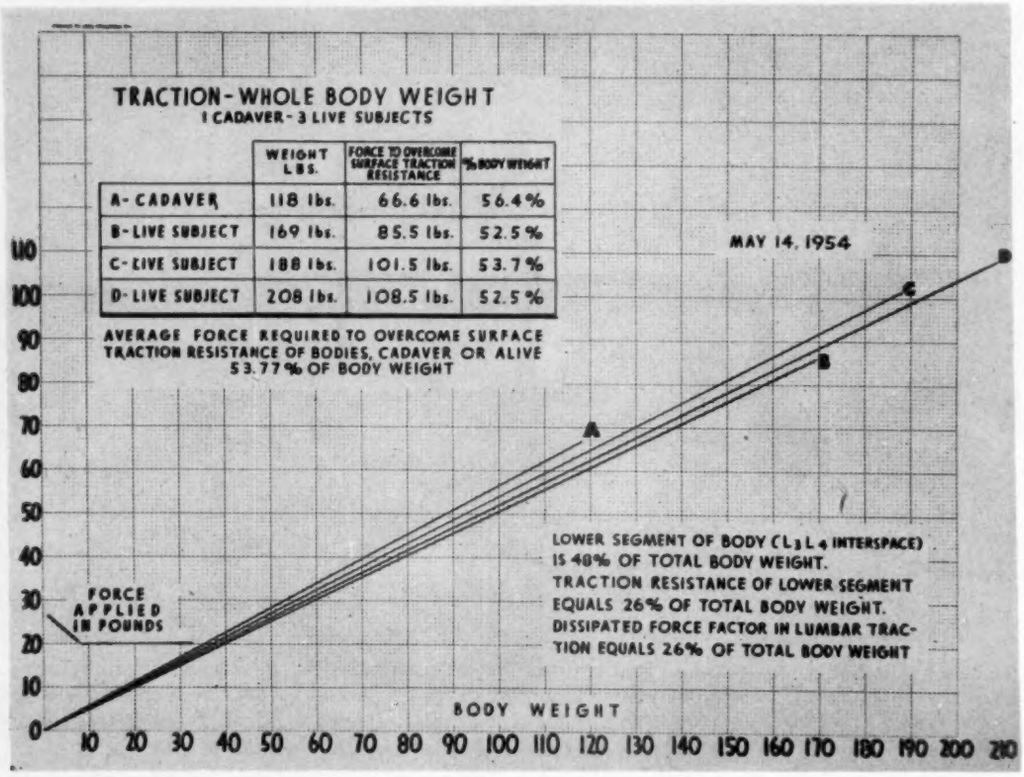
TRACTION - WHOLE BODY WEIGHT
1 CADAVER - 3 LIVE SUBJECTS
WEIGHT LBS.
FORCE TO OVERCOME SURFACE TRACTION RESISTANCE
% BODY WEIGHT
A - CADAVER 118 lbs. 66.6 lbs. 56.4%
B - LIVE SUBJECT 169 lbs. 85.5 lbs. 52.5%
C - LIVE SUBJECT 188 lbs. 101.5 lbs. 53.7%
D - LIVE SUBJECT 208 lbs. 108.5 lbs. 52.5%
AVERAGE FORCE REQUIRED TO OVERCOME SURFACE TRACTION RESISTANCE OF BODIES, CADAVER OR ALIVE 53.77% OF BODY WEIGHT
MAY 14, 1954
LOWER SEGMENT OF BODY (L3 L4 INTERSPACE) IS 48% OF TOTAL BODY WEIGHT.
TRACTION RESISTANCE OF LOWER SEGMENT EQUALS 26% OF TOTAL BODY WEIGHT.
DISSIPATED FORCE FACTOR IN LUMBAR TRACTION EQUALS 26% OF TOTAL BODY WEIGHT
FORCE APPLIED IN POUNDS
BODY WEIGHT
0 10 20 30 40 50 60 70 80 90 100 110
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210

FIG. 2. This graph illustrates the traction force required to overcome surface traction resistance of the whole body. (From: JUDOVICH, B. D. Lumbar traction therapy and dissipated force factors. *Journal-Lancet*, 74: 411, 1954.

lated body segments. The conditions and method of study were published in detail. Figures 2 and 3 contain the information derived from these studies. These studies resulted in the following observations:

1. The forces necessary to overcome surface traction resistance, under the conditions described, whether it be the whole body (in cadavers or living subjects) or body segments, are approximately the same—they average 54 per cent of the weight. Tone and elasticity of tissues appear to have no bearing upon the required force.

TABLE I

Weight of Patient (lb.)	Traction Force at Lumbar Spine without Belts or Weights (lb.)	Equivalent in Hanging Weights (lb.)
130	35	66
140	37.8	74
150	40.5	79.5
160	43.2	81.8
170	45.9	90
180	48.5	93.5
190	51.3	100.7
200	54	106
210	56.7	111
220	59.4	116.5

TABLE II
BODY AND BODY SEGMENT WEIGHTS

Segment	Weight (lb.)	Body Weight (%)
Whole body	118	100
Lower body segment (L3-L4)	58	48
Pelvis	25	21.2
Lower extremity (hip disarticulation)	16.5	14.2
Thigh	10	8.4
Leg and foot (knee disarticulation)	6.5	5.5
Head and neck (C6-C7)*	10	8.4

* In the cervical spine it can readily be observed that no stretch will take place with 5 pounds of hanging weight. Actual figure was 6 pounds of dissipated force.

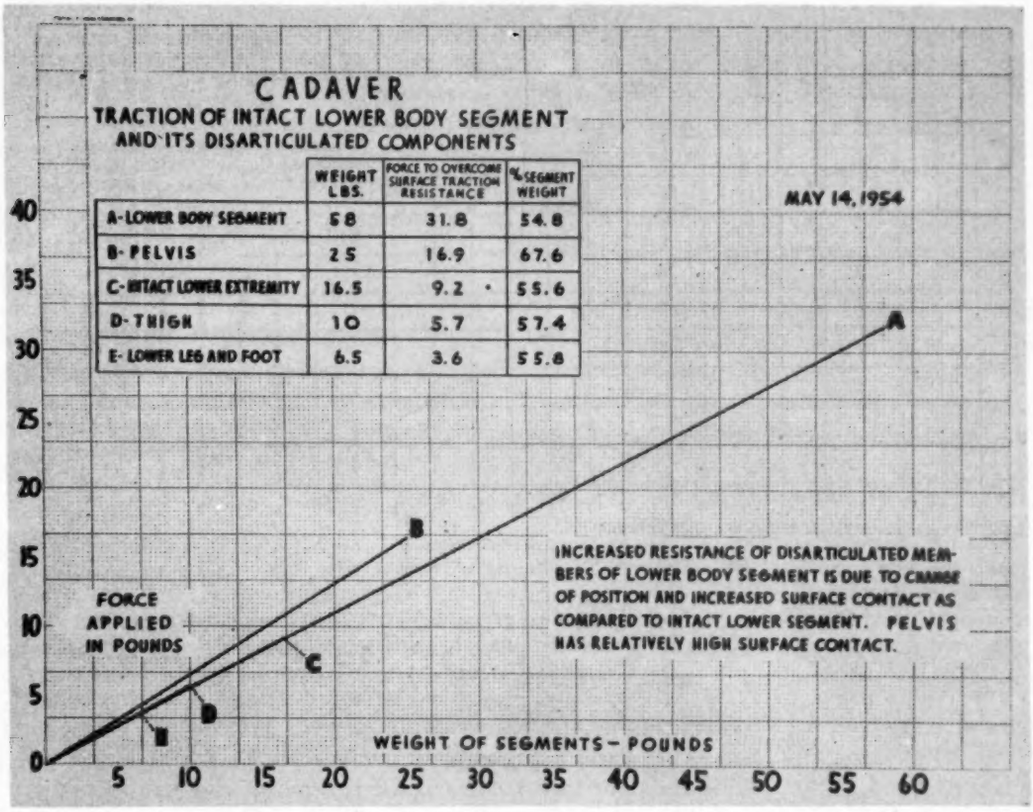
CADAVER
TRACTION OF INTACT LOWER BODY SEGMENT AND ITS DISARTICULATED COMPONENTS
WEIGHT LBS.
FORCE TO OVERCOME SURFACE TRACTION RESISTANCE
% SEGMENT WEIGHT
A-LOWER BODY SEGMENT 58 31.8 54.8
B-PELVIS 25 16.9 67.6
C-INTACT LOWER EXTREMITY 16.5 9.2 55.6
D-THIGH 10 5.7 57.4
E-LOWER LEG AND FOOT 6.5 3.6 55.8
MAY 14, 1954
INCREASED RESISTANCE OF DISARTICULATED MEMBERS OF LOWER BODY SEGMENT IS DUE TO CHANGE OF POSITION AND INCREASED SURFACE CONTACT AS COMPARED TO INTACT LOWER SEGMENT. PELVIS HAS RELATIVELY HIGH SURFACE CONTACT.
FORCE APPLIED IN POUNDS
WEIGHT OF SEGMENTS - POUNDS
0 5 10 15 20 25 30 35 40
5 10 15 20 25 30 35 40 45 50 55 60
A
B
C
D
E

FIG. 3. This graph illustrates the traction force required to overcome surface traction resistance of the lower body segment and its disarticulated components. (From: JUDOVICH, B. D. Lumbar traction therapy and dissipated force factors. *Journal-Lancet*, 74: 411, 1954.)

2. The lower body segment (L3–L4 interspace) composes almost half (48 per cent) of the entire body weight. The only traction force which could have any lumbar stretch effect is that which exceeds the amount needed to overcome the surface traction resistance of this segment. (Table II.)

3. Since the lower body segment is almost half the body weight and requires 54 per cent of its weight to overcome its own resistance, 26 per cent of the entire body weight is calculated as an approximate average figure for the force necessary to overcome lower segment resistance. (Fig. 3.)

4. The 26 per cent of the total body weight which is required to overcome the surface resistance of the lower body segment is designated as the dissipated force factor. This force is completely neutralized and lost as a stretch force to the lumbar spine.

5. Raising the foot of the bed 6 inches (Trendelenburg position) provides only a 5 per cent increase in countertraction, and at the same time increases by this amount the force required to overcome the lower body segment resistance.

6. Buck's extension or pelvic belt traction requires the same force. In one instance the lower segment is being pulled down from below, and in the other it is pulled down from above.

Let us suppose that lower body segment resistance has been completely eliminated and that the full force of hanging weights is exerted to the lumbar spine. Even this (20 to 30 pounds) would be insufficient to provide actual stretch to lumbar vertebral segments. In the cervical spine it has been shown clinically that 30 to 35 or even 45 pounds are frequently necessary for relief of pain [1,7]. X-ray evidence of stretch does not take place until this force is applied.

The first two or three days treatment is administered by having the patient simply lie on the bed, without belts, and allowing the mechanism to function. The stretch obtained in this manner may be sufficient to cause mild ache through the chest and abdominal muscles—the same type of ache one would have in

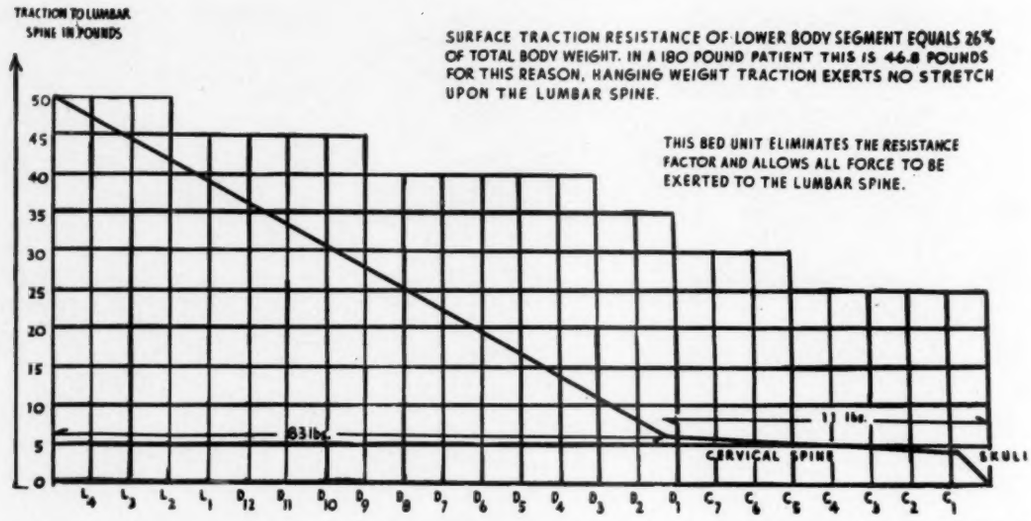
TRACTION TO LUMBAR SPINE IN POUNDS
SURFACE TRACTION RESISTANCE OF LOWER BODY SEGMENT EQUALS 26% OF TOTAL BODY WEIGHT. IN A 180 POUND PATIENT THIS IS 46.8 POUNDS FOR THIS REASON, HANGING WEIGHT TRACTION EXERTS NO STRETCH UPON THE LUMBAR SPINE.
THIS BED UNIT ELIMINATES THE RESISTANCE FACTOR AND ALLOWS ALL FORCE TO BE EXERTED TO THE LUMBAR SPINE.
50
45
40
35
30
25
20
15
10
5
0
CERVICAL SPINE
SKULL

FIG. 4. A 180 pound patient, by lying on the split traction bed and utilizing the countertraction of the upper body segment, without the use of hanging weights or belts, will obtain a pull of approximately 50 pounds in the lumbar spine (28 per cent of total body weight). Pelvic and countertraction belts provide pull to limit of tolerance. This graph depicts the approximate loss in traction of 3 pounds per segment ascending from the lumbosacral region to D1 level.

muscles unaccustomed to exercise. This usually disappears after two to four treatments. If the patient improves clinically, the same type of traction is continued. If not, pelvic and countertraction belts are applied and the force is gradually increased to the point of tolerance.

When traction is applied in this manner, the lumbar traction force can be calculated by inserting a scale on each of the two fastenings of the countertraction belt at the head of the bed. The maximum reading of both scales are totalled. To this figure is added the countertraction value of the upper body segment. This figure is the approximate traction pull exerted at the lower lumbar spine. The actual force is of statistical rather than clinical importance. Tolerance and clinical response should be the guide. It appears that most patients can take 80 to 100 pounds of traction without undue discomfort, some much more.

With adequate pull, the initial reaction is similar to that obtained in cervical spine lesions with brachial plexus pain. At the height of the pull, sciatic pain may disappear completely, disappear to a degree or become aggravated.

In a brief preliminary report of thirty-one patients with signs and symptoms of a herniated lumbar disk, the majority obtained excellent results. Six patients had myelograms which showed definite defects. Four made excellent recoveries. Two did not and submitted to laminectomy. Another patient in this series underwent laminectomy elsewhere. One elderly patient with parkinsonism and Paget's disease of the pelvis did not respond to treatment. Another patient who received adequate traction also did not respond. One patient who had undergone previous laminectomy had a prolonged recurrent attack and failed to obtain relief by traction. The remainder of the patients did very well, the majority obtaining complete or almost complete relief.

One patient had been previously hospitalized with hanging weight traction for one month. The pain had become progressively worse. After two weeks of daily traction, as an office procedure, the patient was discharged and returned to work. Another patient, who had been acutely disabled for five months and had a positive myelogram, recovered sufficiently to be discharged from the hospital after five days of treatment, three hours daily.

Nearly all of the patients in this group had marked signs of a herniated lumbar disk, with acute disability. In all, there were eight failures, one of which was the patient with Paget's disease and a probable herniated disk. Three of the patients who failed to obtain relief refused to have myelograms. The majority of the patients had been previously treated by conservative methods without obtaining relief.

The intermittent lumbar traction described herein is far superior to any type of traction

we have used. The discomfort and the strict confinement resulting from hanging weights are eliminated. There is unlimited traction force available, whereas with hanging weights no traction takes place in the lumbar spine.

This paper, however, is more concerned with the physical aspects of traction and the presentation of facts which deal with traction forces and traction resistance. As a result of these studies we believe that hanging weights for both the cervical and lumbar spines in the treatment of herniated disks is a useless procedure if it is intended for the purposes of traction and overcoming of muscle spasm at these levels. (Fig. 4.)

MUSCLE SPASM

The concept that muscle spasm causes pain and that when it exists in conjunction with, or is precipitated by an accompanying lesion, may cause additional pain, thus producing a vicious pain cycle, appears to be questionable in certain respects. When we consider the individual aspects of muscle spasm in specific clinical conditions, a modified viewpoint is gathered. If we divide muscle spasm into two groups, the first in which there is an intrinsic or direct muscle disturbance, and the other in which the muscle spasm or disturbance is reflex in nature, differences in these two groups can be observed. Trauma, strain, hemorrhage, metabolic disturbances of muscle, inflammation, tender nodules or new growths, of course, are intrinsic muscle disturbances and are a direct cause of local muscle spasm and pain. These constitute the group with intrinsic disturbance. In the second group the muscle spasm is reflex due to irritation of pain-sensitive structures in which no actual change takes place in the muscle, other than spasm.

In many cases of herniated disk, both in the cervical and lumbar regions, muscle spasm is frequently bilateral and commonly contralateral. In spite of the fact that the muscles on the side opposite the lesion may be almost board-like in their splinting action, they are commonly not tender or painful.

The concept that constant mild cervical traction is necessary to overcome muscle spasm for relief of pain is questionable. The bulk of evidence points to the fact that spasm which is associated with a "mechanical" painful neck, such as a herniated cervical disk, is reflex in nature and does not of itself cause pain. Symptoms are due to compression of the nerve root or other pain-sensitive structures, so that the resultant effect is a sensory-motor or motor-motor reflex which results in spasticity of the muscles supplied by the particular nerve root involved.

The reasons for this opinion are as follows: When a herniated cervical disc is present and the paraspinal muscles are spastic with a loss of lordosis, compressing the cervical spine by applying strong pressure downward upon the head shortens the muscle but increases the pain. Tilting the head laterally to the painful side and pressing downward should relax or shorten the muscles on the painful side. Instead of relief, it sharply increases the radiating pain because of the root compression factors which are the actual cause of pain.

In approximately 40 to 50 per cent of herniated cervical disks, if a traction force of 30 to 45 pounds is applied, pain will be instantly relieved, either completely or partially, the moment the force is applied, and pain will return as soon as the force is released [1–3]. This happens too rapidly (1 to 2 seconds) to say that muscle spasm has been overcome. Theoretically, if a muscle is spastic and painful, a sudden pulling force upon this muscle should produce increased pain and spasticity. However, the reverse occurs; the pain either stops completely or partially, which is further evidence that the muscle itself is not producing pain and does not add to the pain cycle. Traction in acute torticollis due to intrinsic muscle irritation causes severe pain.

In spasmodic torticollis due to basal ganglia disease, marked muscle contraction may take place. These patients do not complain of pain, but of a tightness and pulling sensation.

One of the most common types of headache, tension headache, is claimed to be due, at least in part, to spasm of the neck and scalp muscles. In several patients who were particularly susceptible to tension headache, spasm of the muscles in the upper cervical spine and scalp was induced by electrical current and maintained for a period of 20 minutes. This was done while the patients complained of headache. In spite of the fact that spasm was greater in degree than that usually observed during tension headache, no symptoms were produced. While a larger series of patients might be more convincing, we were able to note that muscle spasm alone in these few

cases, superimposed upon the headache, did not produce an aggravation of symptoms. In fact, the patients stated that the pain was alleviated.

SUMMARY

Physical evidence is presented to show that conventional hanging weight traction to the spine by means of head halter, pelvic belt or Buck's extension does not exert a stretch force upon the spine and in most instances no stretch upon the paraspinal muscles. Present methods of constant weight traction therapy to the cervical and lumbar spines do not provide traction at these levels. This is due to the fact that not enough weight is applied to overcome the surface traction resistance of the body segments.

In the cervical spine, traction in the 30 to 45 pound range is the most effective form of therapy for herniated disks and other mechanical lesions in which traction is indicated. In the lumbar spine, 50 to 100 pounds or more is the most effective range.

A new method of motorized intermittent lumbar traction is presented in which resistance is eliminated and unlimited stretch can be applied to the lumbar spine without the use of hanging weights. A brief preliminary clinical report is submitted.

Clinical observations suggest that in these conditions reflex skeletal muscle spasm may have little to do with production of pain, or as commonly believed, the establishment of a vicious pain cycle.

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An Apparatus to Help Maintain Intrathoracic Pressures in Patients after Thoracic Surgery

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THE care of patients after thoracic surgery poses important problems to the surgeon and is complicated by the fact that much of the nursing assistance is offered by people who have little, if any, comprehension of the physiology involved. Since such ignorance may result in fatal errors, it is wise to maintain necessary apparatus in as simple and as near foolproof a condition as possible.

One of the sources of greatest anxiety to the surgeon is the maintenance of proper intrathoracic pressure by means of the conventional water seal drains and vacuum gauge. Registered nurses have a tendency to regard the bubbling bottles as some sort of infernal machine to be regarded with awe and fear. Hospital aides, on the other hand, may regard them with complacent nonchalance and have been known to empty all bottles while computing

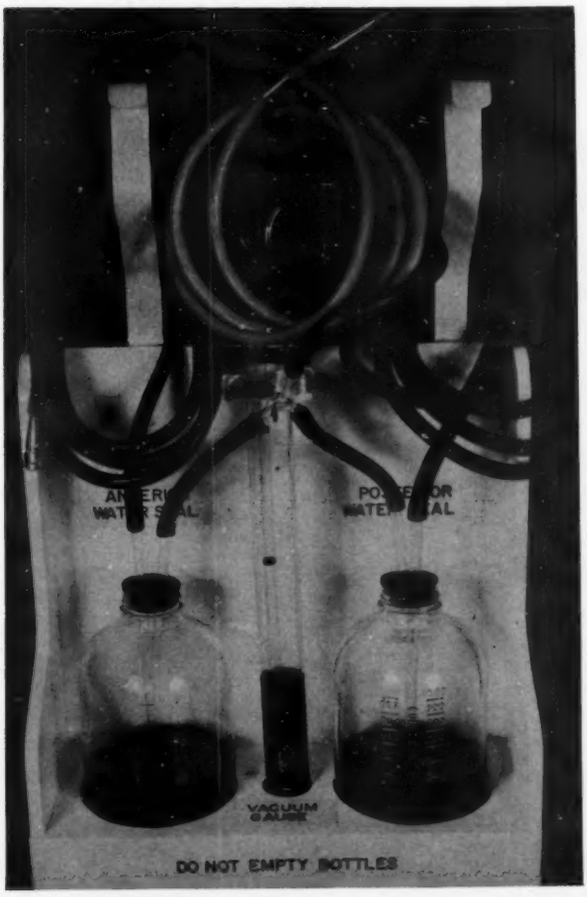

FIG. 1. The assembled apparatus with colored solutions in the bottles for better visualization. A standard amount of sterile water is used for the water seal bottles, usually 400 cc. The vacuum gauge is marked at the 10, 20 and 30 cm. level.

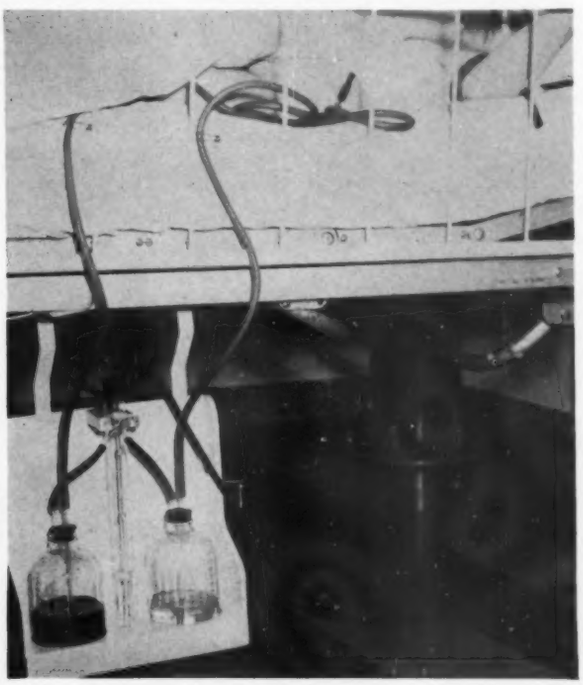

FIG. 2. Photograph of the apparatus in use on a patient. This is an early model before the lettering was added to the unit.

intake and output volumes. Furthermore, postoperatively, bottles have been lifted without clamping the connecting tubes, causing their contents to be emptied into the thorax. Finally, the confusion of bottles and tubing beneath the bed poses both a housekeeping and transportation problem.

To eliminate most of these problems, an easily constructed unit was designed that can be hung on the bed frame and thus be easily transported with the bed. (Figs. 1 and 2.) The entire unit was constructed by station labor from scrap materials or supplies in stock. The wooden frame is constructed of ¼ inch plywood painted white. The bottles used are Baxter parenteral fluid bottles together with their stoppers. The tall vacuum gauge tube is manufactured from glass tubing obtained from our research laboratory which also supplied the necessary lengths of glass tubing and the rubber stopper (three-hole) for the vacuum gauge. The Y connecting tube was obtained from stock. The suspension hooks were made of steel straps.

The unit was first used without labels, but it soon became apparent that some means of identification was desirable. Since it is frequently our practice to use two chest catheters, the two water seal bottles are identified by labels so that the amount of drainage from either tube is quickly identifiable without constantly retracing the connecting tubing.

The vacuum breaker tube in the vacuum gauge is marked at 10, 20 and 30 cm. levels to accommodate for varying degrees of negative pressure desired within the system. The unit itself is labeled to prevent error on the part of hospital aides when computing intake and output volumes. The "do not empty" label insures that the bottles will be changed only by personnel familiar with their purposes. The suction to the unit is supplied by a continuous built-in wall suction. The use of a thermotic, Stedman or water suction pump may be substituted if necessary.

The unit at maximum capacity can supply 30 cm./H_2O negative pressure to two water seal drains and thus two chest catheters. This maximum capacity can be modified to 10 cm./H_2O negtive pressure to one water seal drain; or, if desired, the negative pressure need not be utilized. This unit has been in use for almost a year and has been found to be inexpensive, practical and generally desirable.

SUMMARY

A homemade unit for the more efficient assembly of water seal drains with or without a vacuum gauge used in the care of patients after thoracic surgery is described.

A Modified Technic for the Removal of the Appendix during Pregnancy

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THE surgeon who removes an acutely inflamed appendix during the last trimester of pregnancy undertakes a hazardous procedure. Not only is the maternal mortality rate considerably higher than it is for acute appendicitis in the general population[4–7] but also the fetal mortality may be as high as 35 per cent.[4–6] While the increasing use of antibiotics and better methods of fluid therapy and anesthesia will undoubtedly reduce this figure considerably, the fundamental principle, as stated by DeLee and Greenhill,[2] of "get in and get out quickly" is still the most important single factor in the possible reduction in complications or death to either the fetus or the mother. The

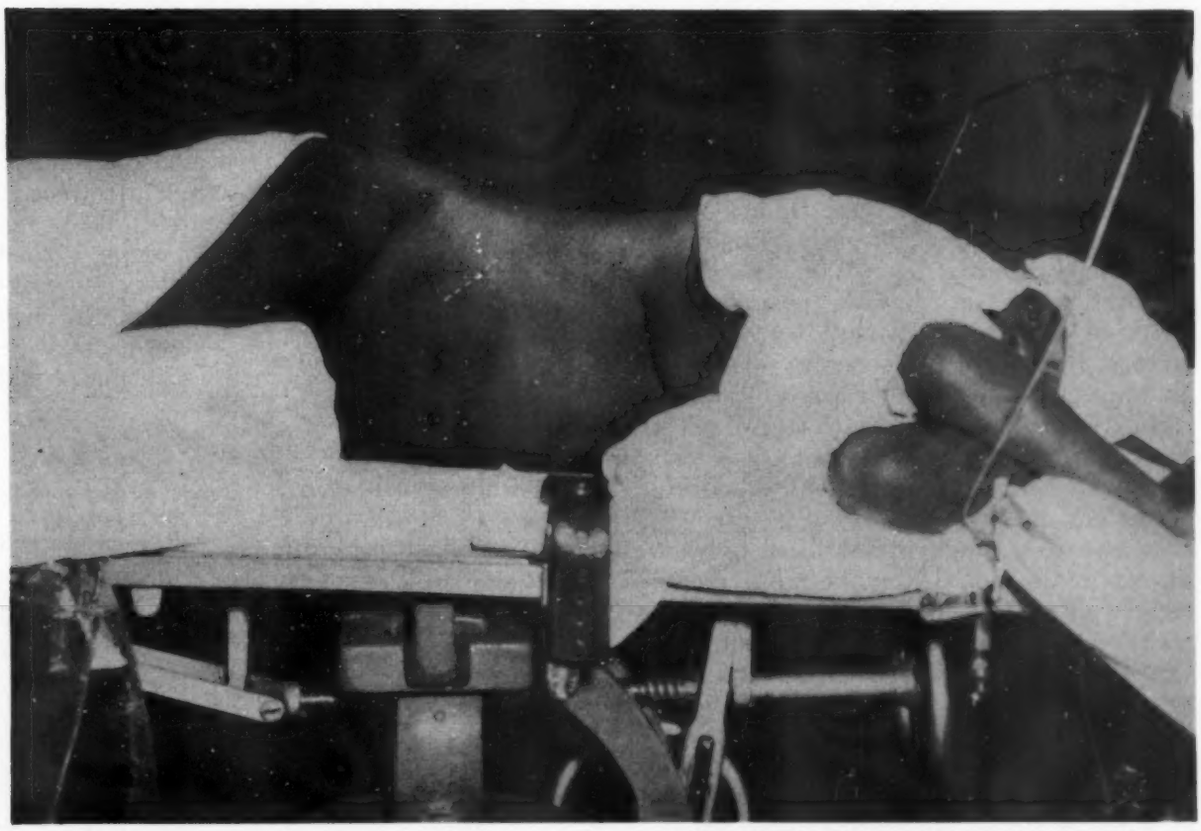

FIG. 1. The patient is placed upon her left side on the operating table. An oblique McBurney type incision is made at the line indicated. This line is above the umbilicus and slightly more lateral than the usual McBurney incision. The muscle fibers are split in the same manner, however, to enter the peritoneal cavity.

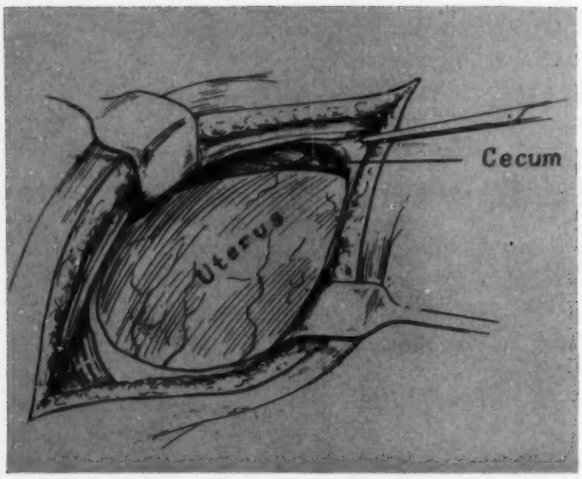

FIG. 2. The enlarged uterus almost completely fills the floor of the incision after the peritoneal cavity is entered. The edge of the cecum can be seen in the lateral and upper edge of the wound. The operator's finger can then be placed into the lateral peritoneal gutter and exploration for the appendix performed.

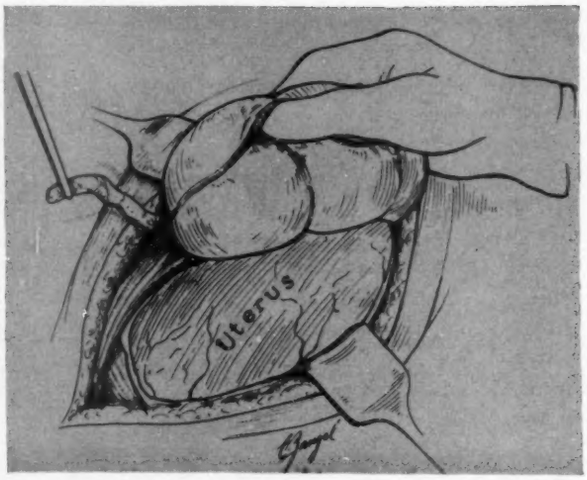

FIG. 3. The cecum has been drawn up into the wound and the appendix mobilized for removal. Little if any retraction is needed on the gravid uterus.

irritability of the gravid uterus and the lack of the usual defense mechanisms in the abdominal cavity emphasize the necessity of a rapidly performed operation with a minimum of retraction and manipulation.

Quite frequently this is a difficult task to accomplish. As the uterus enlarges and fills the pelvic cavity and lower abdomen, the cecum and appendix are displaced upward and slightly laterally.[1] The accessibility of the caput coli through the conventional right lower quadrant McBurney or paramedian incision with the patient in the usual position on the operating table is considerably less than satisfactory. Because of the necessity for considerable retraction on the enlarged uterus and mobilization of the cecum into the wound, the procedure is usually accompanied by more trauma than when appendectomy is performed on the non-gravid patient.

In an attempt to obviate these difficulties we have established the following modified technic for appendectomy in the late months of pregnancy. The patient is placed upon her left side (Fig. 1) in order that the uterus will naturally fall away from the operative field. A McBurney type of muscle-splitting incision is made, for we believe that this method of opening the abdominal cavity permits healing with less likelihood of eventual herniation during the strain of delivery. The incision, however, is placed considerably higher on the abdominal wall above a line drawn from the anterosuperior spine to the umbilicus in order to reach the cecum easily at its higher position. When the abdomen is opened it will be noted that the floor of the wound is filled by the lateral wall of the uterus with the cecum still more lateral and cephalad. (Fig. 2.) A finger can then be placed under the anterior taenia and the cecum held in position or mobilized into the wound while the appendix is removed. (Fig. 3.) Needless to say, if the appendix is found to be in a retroperitoneal or retrocecal position, dissection must be carried out posteriorly. However, by utilizing this simple method of placing the patient on her left side and making the incision at a level to reach the high position of the cecum, the operation may be performed with less difficulty than one would anticipate.

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Operative Cholangiography via the Cystic Duct: A Hint on Technic

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SURGEONS who employ operative cholangiography routinely prefer to introduce the contrast medium into the common bile duct via the cystic duct, if the gallbladder is present and is to be removed. The tube that is used may be either a fine ureteral catheter or a similar-sized polyethylene tubing.

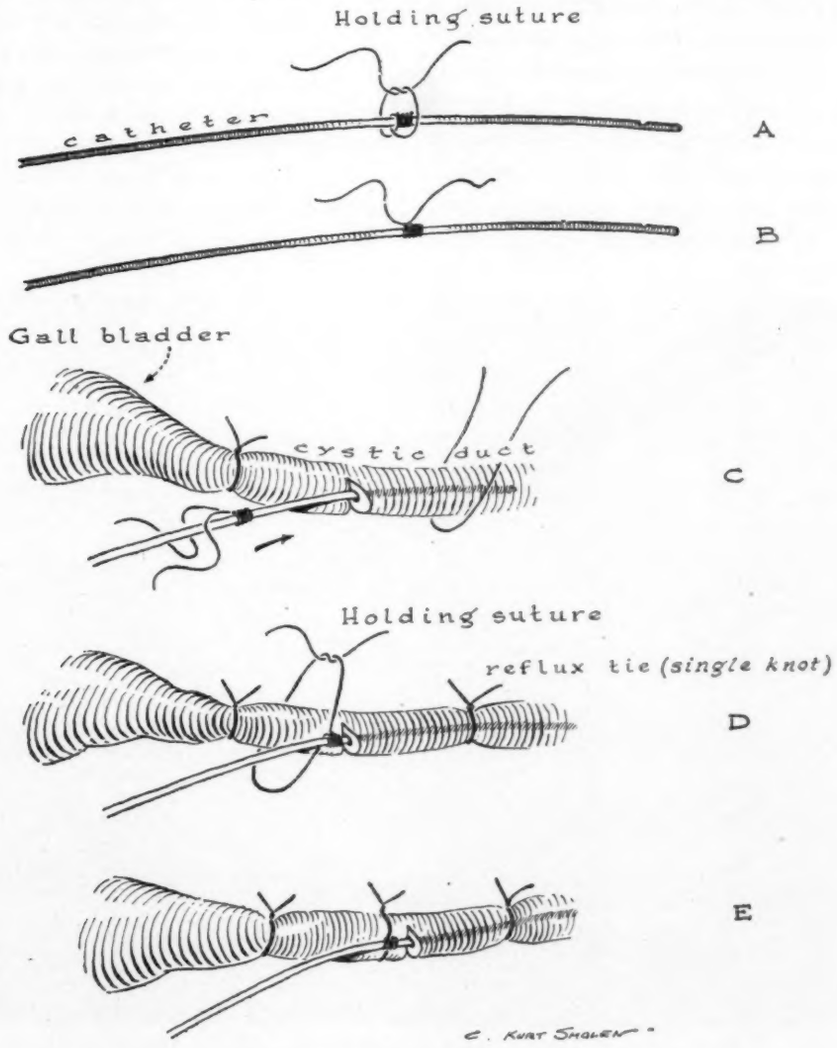

FIG. 1. Holding suture for catheter used in operative cholangiography.

All surgeons develop their own technical tricks to avoid introduction of air and reflux of bile or contrast medium, which can produce roentgenographic artifacts that become major hindrances to diagnosis. A technical mishap that is capable of causing such artifacts occurs when the catheter slips out of the cystic duct while packs are being adjusted or removed prior to exposing the cholangiogram. A satisfactory method for securing the catheter is illustrated in Figure 1.

The surgeon determines the distance he wishes to insert the catheter (usually about 3 cm.). A ligature is tied onto the catheter at that distance. Several turns, each secured with a knot, assure no slipping of the ligature on the catheter. (Fig. 1, A and B.) A ligature is tied proximally on the cystic duct to prevent reflux of bile from the gallbladder. A similar ligature is placed distally and is left untied until the catheter is in position in the cystic duct (Fig. 1, C); a single knot will then prevent both the introduction of air into the common duct and the escape of fluid.

The catheter is introduced into the cystic duct. A Babcock or Allis clamp may be used to hold the catheter in position while the holding suture is being tied to anchor the catheter to the cystic duct. (Fig. 1, D and E.) The cholangiogram now may be completed.

The holding suture is cut with a knife blade, the catheter is withdrawn, and the single tie on the common duct side is made tight and is completed as a square knot to ligate the cystic duct effectively. Cholecystectomy may then be completed.

A Useful Tool during Endoscopic Resection

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DURING endoscopic resection of the prostate gland or a tumor of the bladder, a constantly clear view of the operative field is of paramount importance. Occasionally, the site of operation is obscured by a blood clot or the fragments of resected tissue that adhere to the cutting loop despite its forward excursion or attempts to wash the fragments forward into the bladder with the irrigating solution. The use of the fingers or instruments for cleaning the loop damages its delicate wire and delays the operation. Continuation of the procedure in the hope that the next cut will dislodge the debris from the loop is hazardous.

For the last three years, I have found that an ordinary handbrush is a very practical and useful tool in such a situation. The cutting loop is simply rubbed against the brush whenever a piece of excised tissue or blood clot is caught in it and remains adherent. (Fig. 1.) In this way, distortion of and damage to the cutting loop are avoided, a clear field of vision is maintained throughout resection, and the speed and safety of the procedure are increased. The method is especially advantageous in operations performed on patients with a tendency to bleed and in those in whom the instrument is manipulated with one hand.

As part of the equipment for performing routine endoscopic resection, a handbrush is enthusiastically recommended.

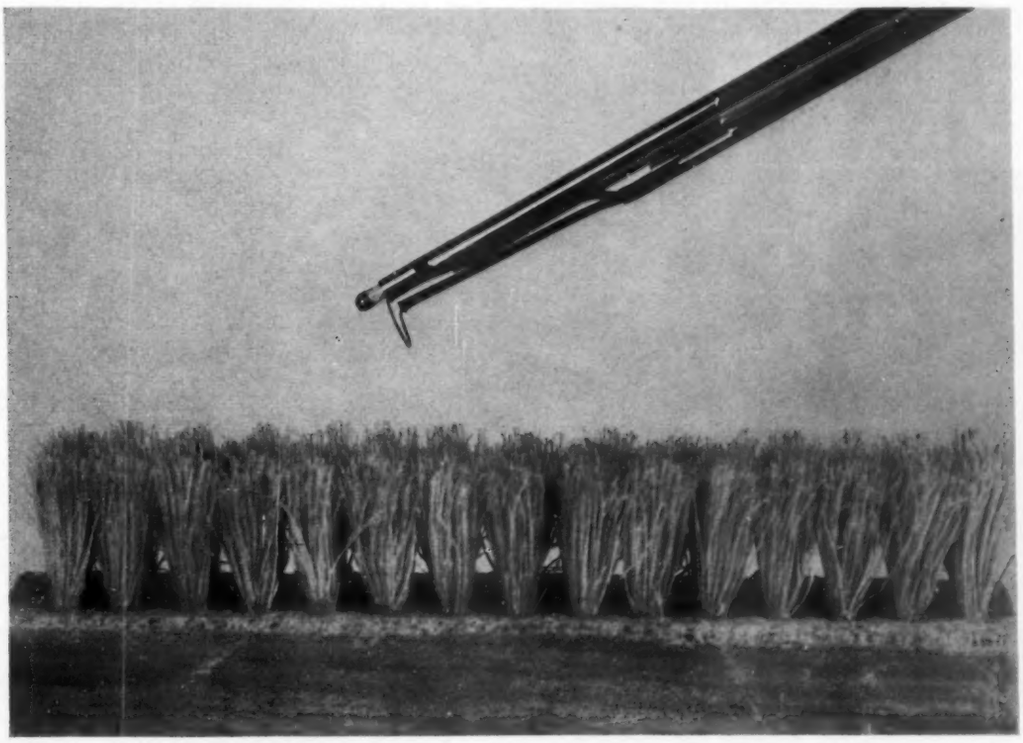

FIG. 1. A sterile handbrush, placed with bristles upright on the instrument table, is an excellent device for removing clots and tissue from the cutting loop during endoscopic resection.

Anomalous Termination of the Common Duct

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THE case reported herein is one of anomalous termination of the choledochus into the main pancreatic duct disclosed by operating room cholangiography. To our knowledge this is the first cholangiographic visualization of this particular anomaly.

Mentzer and others[1,2] have estimated that less than 10 per cent of persons have anomalous biliary tracts. By far the majority of the anomalies occur in the upper portion of the biliary tree and relatively few in the terminal portion, if the four common varieties of termination of the common duct are considered normal.[3-6]

CASE REPORT

T. B. S. (No. 93853), a sixty-three year old white housewife, was first seen in the Clinic in April, 1955. The pertinent items in her history included the following data. For approximately one year she had experienced vague episodic upper abdominal pain. On several occasions the pain had awakened her from a sound sleep and was relieved by the ingestion of food. There

FIG. 1A. Cholangiogram showing the common bile duct entering the main pancreatic duct at some distance from the ampulla.

FIG. 1B. Diagrammatic sketch of the anomaly. Arrow indicates the location of the ampulla of Vater.

was no history of fat intolerance, jaundice or melena. The stools had occasionally been light yellow but never clay-colored.

Physical examination showed a well developed and well nourished white woman. The vital signs were normal except for a moderate hypertension. Abdominal examination revealed moderate tenderness to deep palpation in the right hypochondric region. No abdominal masses were palpable.

Routine laboratory examinations were within normal limits. Cholecystography revealed multiple radiolucent calculi. The upper gastrointestinal roentgenologic examination was normal.

The patient returned for cholecystectomy in May, 1955, after being on medical management for one month with no relief of symptoms. The cholecystectomy was not unusual until it was noted by the surgeon that there was an anomaly of the cystic artery, with the cystic artery lying anterior to the cystic duct. Following ligation of the cystic artery, the cystic duct was opened and a polyethylene tube was inserted. A cholangiogram was obtained in the usual manner using 35 per cent diodrast.® The cholangiogram showed an anomalous termination of the common duct into the duct of Wirsung approximately 2 cm. proximal to the ampulla of Vater. (Fig. 1.) The pancreas was palpated and no abnormalities were noted. Since there was no indication to explore the common duct, the removal of the gallbladder was completed following ligation of the cystic duct. The patient's postoperative course was uneventful.

COMMENTS

Anomalies of the common duct are well visualized by means of cholangiograms and their value to the surgeon in exploration of the duct system has been advocated previously.[7–9] It is interesting to note that this case presents not only an anomaly of the terminal ducts but also of the vascular portion of the biliary tree. It seems advisable for surgeons who encounter anomalies during cholecystectomy to have a cholangiogram performed during surgery in an effort to demonstrate other anomalies which might be present. It is also interesting to note that although the biliary system emptied into the main pancreatic duct, the patient had no evidence of pancreatitis.

SUMMARY

An unusual termination of the common duct into the main pancreatic duct disclosed by cholangiography has been presented.

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Benign Tumor of the Cystic Duct Producing Symptoms of Chronic Cholecystitis

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BENIGN tumors of the extrahepatic biliary system occur rarely. Benign tumors of the cystic duct occur less frequently than other types of extrahepatic biliary tumors. A review

FIG. 1. Retrogastric herniation of small bowel.

of the literature on this subject reveals that most authors have seen a few cases [*1–10*]. A comprehensive review of the literature presented by Chu [*11*] outlined the types of pathologic disease encountered. Cole [*12*] has called attention to the significance of benign disease of the cystic duct as related to the pathogenesis of cholecystitis.

The purpose of this paper is to present the pathologic conditions noted, to call attention to the cystic duct as a source of disease in patients having biliary symptoms without stones, and to stress the value of the clinical history and its correlation with the x-ray findings.

CASE REPORT

This patient, a twenty-one year old white man, had had pain in the abdomen for many years, dating back to the time he was a child. He had been studied in many clinics and had undergone repeated x-ray examinations of the gallbladder and gastrointestinal tract in the armed services, yet no clinical or pathologic diagnosis had been made. On one examination (Fig. 1) it was noted that the patient had a retrogastric herniation of the small bowel. The presence of this herniation did not entirely explain the patient's symptoms until it was demonstrated that he did have gastric dilatation as a result of duodenal obstruction. Because of these findings the patient was operated upon and the abdomen was explored. It was found that the patient had a large defect in the transverse mesocolon to the left of the middle colic artery. The ligament of Treitz was nonexistent as such, and the mesentery of the small bowel was extremely mobile, permitting the small bowel to herniate through the defect in the transverse mesocolon. This was repaired by closing the defect in the transverse mesocolon, fixing the duodenum at the ligament of Treitz and creating a mesentery for the small bowel. At the time of the operation the gallbladder was palpated and it was found to be soft and pliable.

Shortly after this operation the patient again complained of pain in the abdomen, and at this

FIG. 2. Cholecystogram demonstrating normal gallbladder.

FIG. 3. Cholecystogram seventy hours later showing delayed emptying.

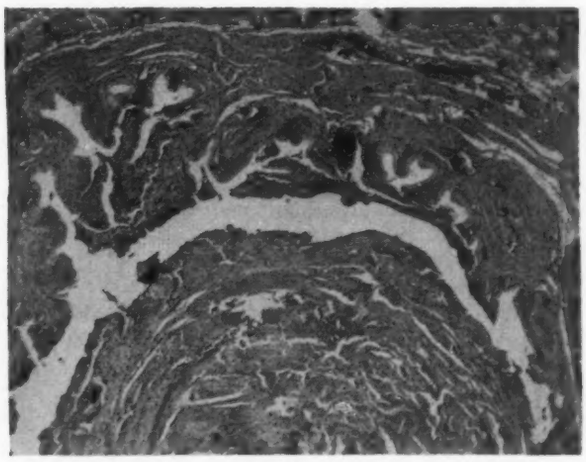

FIG. 4. Low power magnification of fibroepithelioma in cystic duct.

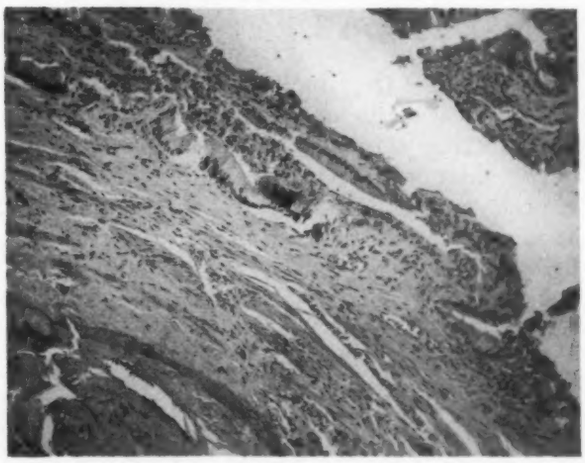

FIG. 5. High power magnification of fibroepithelioma.

time the pain was subcostal. There was definite tenderness on expiration and the patient had an elevated white count to 19,000. He was given antispasmodics and the pain was relieved in approximately two days. His symptoms returned, and at this time a cholecystogram was obtained. On this examination it was found that the gallbladder did not completely empty itself for over seventy hours. (Figs. 2 and 3.) Because of the clinical and x-ray findings this patient was re-explored and the gallbladder was removed. There were no gross abnormal findings at the time of surgery except that the cystic duct appeared smaller than normal.

The pathologist reported the following: Grossly, the specimen consisted of a gallbladder that measured 7.5 by 2.5 cm. The small portion of attached cystic duct was probed and an obstruction was noted. Multiple sections were made of the cystic duct for histologic examination. The fundus of the gallbladder was moderately distended. The serosal surface was smooth and gray-green in color. The hepatic surface was roughened by the usual torn ends of fibrous tissue. The gallbladder was opened. The

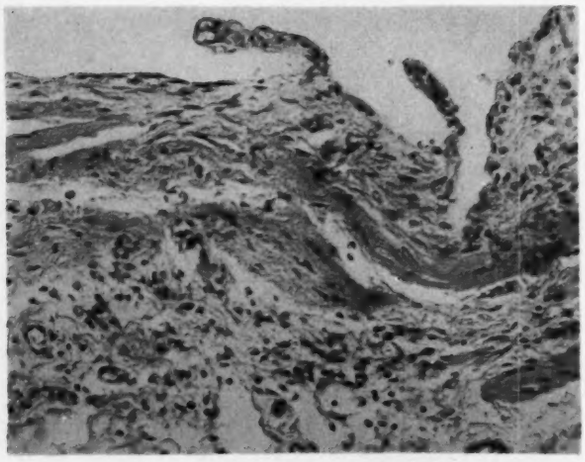

FIG. 6. Microsection of the gallbladder showing cholesterosis.

mucosa was of a faint rugose texture and stained dark green-black with bile. No concretions were noted.

Microscopically, sections of the cystic duct taken at the site of the obstruction in the lumen revealed two-thirds of its inner surface to be lined by the usual tall, columnar epithelium typical of the extrahepatic bile ducts.

Projecting outward from the wall of the cystic duct was a benign tumor mass that almost completely obstructed the lumen. This structure was formed by a proliferating mass of fibrous tissue covered by a few remnants of columnar epithelium and thin strands of smooth muscle. (Figs. 4 and 5.)

In the center of the polyp there was a central clear space which was artefact due to the passing of a probe.

The wall of the cystic duct was thickened by fibrous tissue proliferation and there were focal infiltrates of lymphocytes.

Multiple sections of the fundus of the gallbladder wall (Fig. 6) revealed an intact mucosa formed by papillary projections of the tall columnar epithelium. In the immediate subepithelial fibrous tissue were focal collections of foam cells. At various levels in the wall of the gallbladder, lymphocytes were noted, some scattered diffusely and others arranged in solid lymphoid aggregates. In addition, occasional eosinophils were noted.

The diagnosis was: (1) fibroepithelial papilloma of cystic duct with obstruction of lumen, partial; (2) chronic cholecystitis, moderate; (3) cholesterosis of gallbladder, early.

Since removal of his gallbladder the patient has gained weight and has been symptom-free for one year, which is the longest period that he has been free of symptoms.

SUMMARY

A case is reported of benign fibroepithelioma of the cystic duct complicated by the presence of an internal hernia. Attention is called to search of the cystic duct for pathologic disease in patients with clinical symptoms of disease of the gallbladder.

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Traumatic Rupture of the Testicle

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The term traumatic rupture of the testicle synonymous with closed rupture of the testis, fracture of the testis and explosive rupture of the testis has been used by some authors as or in the same category as laceration of the testis, penetrating wound of the testis, contusion of the testis, and even surgical rupture or incision of the testicle (Senger, McCrea, Rolnick and Terrillon). Clinically and pathologically, such a multiplicity of terminology becomes confusing and it would be more accurate if one confined the term of rupture of the testis to that type of traumatic lesion associated with the tear of the tunica albuginea, but without disruption of the overlying skin. This usage is in concordance with the meaning of "rupture" in other portions of the genitourinary tract. Campbell and Lowsley and Kirwin have also used the term in this manner.

Incidence. Review of the literature demonstrates that traumatic rupture of the testicle forms a definite clinical entity. This, however, has not always been adequately described. In studying the reported cases it becomes evident that this is a comparatively rare accident, but nevertheless the number of traumatic ruptures of the testis that have remained undiagnosed and consequently unreported is open to question.

Traumatic rupture of the testis has been seen in patients from eight to seventy-nine years of age. Among the twenty cases on record, thirteen (or more than 65 per cent) have occurred in patients less than thirty years of age and all patients have been younger than fifty. (Table 1.) These statistics substantiate the statement of McCrea regarding the frequency of this injury being confined to the period of increased physical activity.

Review of Literature. In 1906 Cotton reported the first case of traumatic rupture of the testis, that of a forty-seven year old man who was struck by a baseball.[1] Ten years later Malapert reported the second case, and up to 1946, when Wesson[7] reviewed the literature and reported an additional case, seven more cases were reported by Campbell in 1937, Navarrete in 1937, Castro in 1940, Counseller and Pratt in 1944 and Sejournet in 1944. Wesson did not mention the last case and therefore considered his own case to be the ninth, whereas it was actually the tenth.[15]

After Wesson, two additional cases were reported in 1947,[8] but the second review was completed by McCrea in 1951.[15] He described the subject well and compiled a table showing the various authors, age of patients, symptoms and type of treatment instituted.

McCrea states that his case was the thirteenth, but actually it is the sixteenth since he deleted three cases.[9,10,12] Lastly, after McCrea's case, four more cases have been reported.[16,17,19,20] It is the purpose of this paper to report an additional case, bringing the total to twenty-one.

Etiology and Pathogenesis. Knowing that trauma is the only etiologic factor in rupture of the testis, the answer to why we see so many traumatic lesions of the scrotal contents but rare involvement of the testicles is as follows: (1) Velpo, for the first time, called attention to the shape and mobility of the testis in the scrotal sac. This is an important factor which enables the testes to escape injuries. (2) According to Wesson's experience, about 50 kg. or almost 110 pounds of force is necessary to rupture the testis when it is caught between two resistant objects. (3) According to McCrea, the blow must be directed straight or obliquely upward to impinge the testicle between the pubic symphysis or the thigh and the hard traumatizing object.

Therefore, whenever the aforementioned conditions are present, rupture of the testis can occur regardless of the nature of the

TABLE I
REPORTED CASES OF TRAUMATIC RUPTURED TESTIS

Author and Year Reported	Age of Patient	Cause of Trauma	Diagnosis	Treatment
Cotton (1906)	47	Baseball	Ruptured varicocele	Orchiectomy
Malapert (1916)	17	Kick of horse	Slight contusion	Repaired
Campbell (1937)*	8	Astride foot of bed	Hematocele	Repaired
Navarrete (1937)	30	Astride metal hand rail	Epididymitis	Orchiectomy
Navarrete (1937)	27	Belt buckle	Hematocele (and hematoma)	Orchiectomy
Castro (1940)	16	Knee	Hematocele (and hematoma)	Orchiectomy
Castro (1940)	27	Blow of football	Hematocele (and hematoma)	Orchiectomy
Counseller and Pratt (1944)	17	Buttocks (in football)	Hematocele (and hematoma)	Repaired
Sejournet (1944)	21	Kick	Hematocele (and hematoma)	Orchiectomy
Wesson (1946)	49	Sledge hammer	Hematocele (and hematoma)	Repaired
Senger et al. (1947)	28	Kick	Hematocele (and hematoma)	Orchiectomy
Senger et al. (1947)	16	Kick of horse	Hematocele (and hematoma)	Orchiectomy
Trabucco and Comotto (1948)	27	Fell astride hole	Hematocele (and hematoma)	Orchiectomy
Ortiz and Bonta (1948)	15	Kicked in football	Ruptured testis	Repaired
Barbosa (1949)	40	Struck by piece of iron	Hematocele (and hematoma)	Repaired
McCrea (1951)	16	Baseball	Hematocele (and hematoma)	Repaired
Dundon (1952)	49	Kicked in fight	Bilateral hematocele with hematoma	Repaired
Long (1952)	32	Thrown from motorcycle	Hematocele	Orchiectomy
Laird (1954)	16	Soccer ball	Hematocele, possible rupture	Repaired
Norton et al. (1955)	34	Car accident	Hematocele, possible rupture	Orchidectomy

* Case quoted by Campbell, M. F.[2]

trauma which in the reported cases has included blows sustained from a baseball or football, a sledge hammer, a belt buckle, a kick, a fall from a motorcycle, saddle injuries and, in our case, a branch of a tree.

Pathology. In addition to ecchymosis, edema, rupture of the tunica vaginalis and presence of fresh blood or blood clots in the scrotal sac, the pathologic appearance of a ruptured testis may vary. A small tear in the tunica albuginea to almost complete destruction of the testis may occur (case of Long[17]). In almost all of the cases reported the tunica albuginea has been torn transversely (except one case of Dundon[16]). In two patients the lower pole of the testis has been shattered. Associated injuries of the epididymis, spermatic cord, penis and urethra must also be considered.

Symptoms. The symptoms of traumatic rupture of the testis in order of importance and frequency are pain, swelling, nausea and vomiting, shock, ecchymosis, obliteration of the scrotal folds and discoloration of the skin.

Pain is always present to a greater or lesser degree following the accident. In some patients it is very severe and in others very mild. In most patients pain subsides within a few minutes to an hour; in a few patients pain lasts for two to four weeks.

Swelling has been noted in all of the cases except one case reported by Castro.[4] Swelling is gradual and increases slowly. This never becomes excessive unless there is also a ruptured spermatic cord.

Nausea has occurred in two patients and was associated with vomiting in the case reported by Long.[17]

Shock has occurred in a moderate degree in four cases without having a definite relationship with the severity of the pain being experienced by the patient. Kocher quotes two instances of death occurring from shock caused by testicular injury.[14] Unfortunately, these cases have not been reported in the literature.

Ecchymosis has been seen, particularly in Cotton's case, in which the scrotum became purple-black in color. Discoloration of the skin was also reported by Wesson.[7]

Diagnosis. In fourteen of eighteen cases, the diagnosis has been hematocele with or without hematoma. The remaining cases have been called ruptured varicocele, orchiepididy-

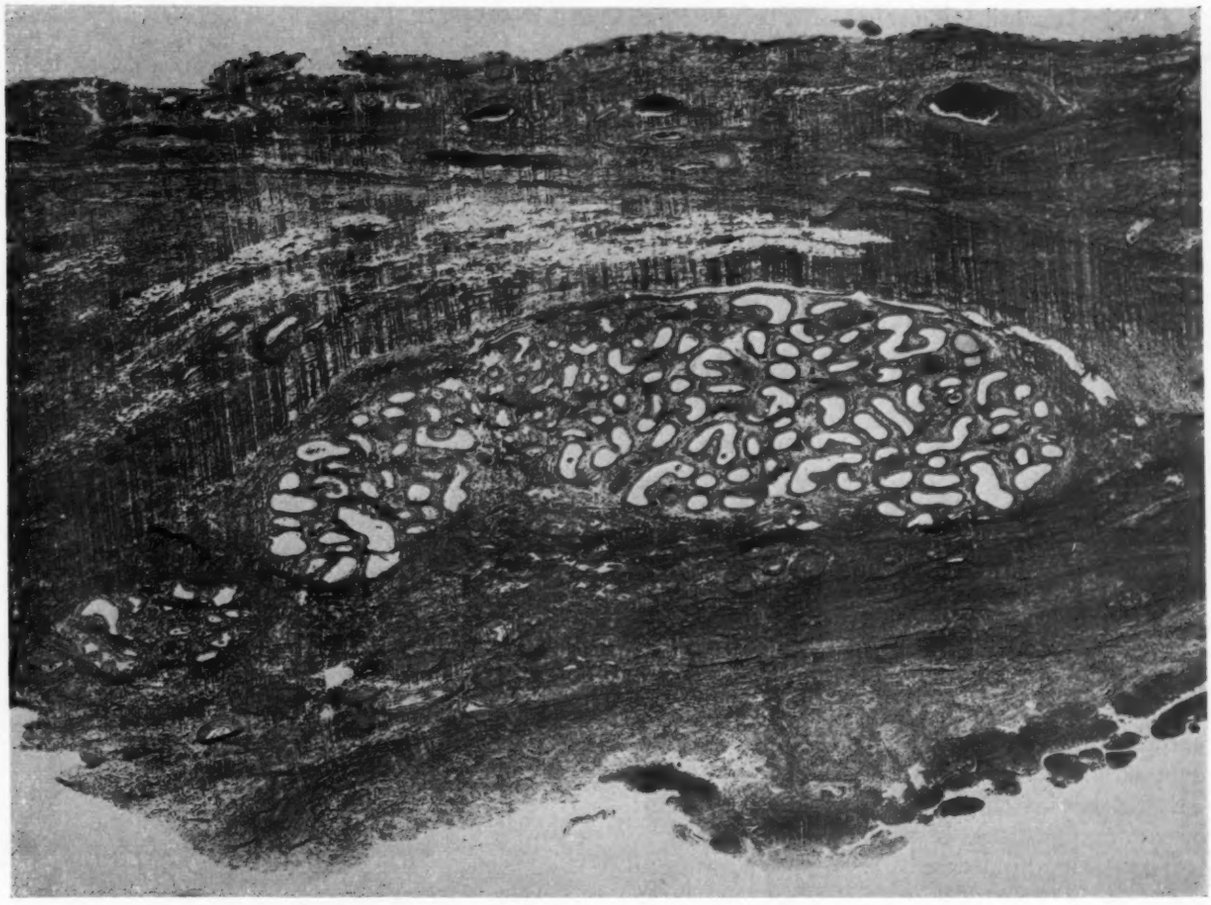

FIG. 1. Traumatic ischemia and necrosis of the testis.

mitis, hydrocele and slight contusion of the testis. After becoming aware of such a clinical entity, the history of a severe blow followed by pain which almost subsides completely and subsequent swelling should be valuable clues in the proper diagnosis.

Complication and Prognosis. Secondary infections, suppuration, degeneration and atrophy of the traumatized testicular tissue are the most likely sequelae. The prognosis will not be severe if the trauma has been unilateral and the patient has two testicles.

Treatment. In order to institute proper treatment, traumatic hematocele must be explored surgically.[2,15,16] If rupture of the testis is noted, the organ should be repaired with preservation of as much tissue as possible. Replacement of herniated testicular tissue must be performed or the frayed fragments trimmed with closure of the capsule.

In 1895, Receus stated that any repaired testis after rupture would become atrophic within six weeks. In 1912, Guiteras also maintained that atrophy would occur. Campbell, Wesson, McCrea, Rolnick and Dundon were not able to substantiate this fact in their work. The cases of Dundon (normal-sized testis seven months following repair) and Campbell (normal-sized testis seven years after repair) are outstanding examples of successful surgical intervention.

The following case is the eighteenth example of a misdiagnosed rupture of the testis.

CASE REPORT*

T. H., a seventy-one year old white man, was struck in the groin and scrotum by a tree branch which he was pulling out of a fence. Five days later he was admitted to Redford Branch of Receiving Hospital complaining of general malaise and a painful, tender, swollen right scrotum.

* Courtesy of the Pathology Department, Receiving Hospital, Detroit, Michigan.

Physical examination revealed a temperature of 100.2°F. and pulse of 78. A fist-sized, tender, firm mass was present in the right scrotum which did not transilluminate.

Diagnosis of traumatic hematocele was made. This was followed by the usual ineffectual therapy of antibiotics, sitz baths, scrotal support and the like.

Nineteen days later the patient still had no relief of pain. Twenty-four days after the injury occurred the scrotal contents were surgically explored. A torn right testis was removed. The patient made an uneventful recovery. The pathologic report showed ischemic necrosis of the testis due to trauma. (Fig. 1.)

SUMMARY

Traumatic rupture of the testis is described as a clinical entity.

The importance of the following three points is emphasized: (1) In trauma of the scrotum, the possibility of rupture of the testis must be kept in mind. (2) Any accidental traumatic hematocele should be surgically explored. (3) The testis must be repaired with preservation of as much tissue as possible.

The twenty-first case of traumatic rupture of the testis is reported.

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Complications of Acetabular Fractures Following Posterior Dislocation of the Hip

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Indifference or just disregard of a patient's complaints following a fracture can lead to irreversible tissue damage. Fractures or dislocations in the vicinity of major nerve pathways should always be suspected of involving the nerve until proved otherwise. Paralysis, pain or loss of sensation beyond the fracture site should be investigated immediately. The nerves of the body are durable communication pathways, but they cannot withstand any prolonged trauma or pressure. If pressure is relieved when danger signs arise, the patient maintains a normal-functioning extremity.

Sciatic nerve involvement following posterior dislocation of a hip is rare, with only approximately 0.5 per cent of the cases ever having this complication. It is a syndrome about which little is written. Textbooks mention it only as a possibility of such an injury, and few papers appear in the literature to add any further knowledge on the subject. It is a rare complication, but one that can be tragic to a patient if overlooked.

In posterior dislocations of the hip, the head is extruded through the capsule at the lower posterior portion and ascends upon the dorsum of the ilium. Not infrequently, fractures of the superior rim of the acetabulum are associated with the dislocation. As a rule, when the loose fragment from the acetabulum is attached to the capsule, the fracture may be reapposed satisfactorily upon reduction of the dislocation. If, however, the fragment is relatively large and cannot be properly reduced, open reduction may be indicated. Before operation careful examination should be made of the status of the sciatic nerve, as complete or partial physiologic block of this nerve is a complication and its treatment should be immediate.

The sciatic nerve is injured from stretching of the nerve trunk over the head of the femur or compression of it in the sciatic notch. It was not until 1945, when one of the authors (O. C. H.) reviewed three cases of sciatic nerve involvement after posterior dislocation of the hip, that the literature mentioned the complication of nerve damage due to bone fragments from the acetabulum.

The author's three cases all presented about the same findings. Dislocation of the hip, which was reduced, followed by constant pain down the thigh, inability to move the leg, foot drop, and "pins and needles" in the foot were more or less common in each case. The sciatic nerve was explored within three days in two of the cases, and in three months in the other case. Fragments of bone were found involving the nerve trunk; and once these were removed, the complaints of pain subsided. Complete function returned in the two cases in which exploration was early; there was loss of power in the case in which operation was performed after three months of complaints.

How long a nerve can be traumatized and return to normal function is unknown, but the sooner the operation the better the prognosis.

CASE REPORT

A. C., a sixty-one year old white woman, sustained multiple injuries in an automobile accident in August, 1954. The patient was unconscious on admission to the hospital. She was found to have fractures of the humerus, left wrist, right femur, left ankle, the pelvis with injury to the urinary bladder, and dislocation of the left hip. The humerus and femur had open reductions with metal fixation; the hip was reduced and a hip spica applied.

Once the patient became oriented, she com-

plained of pain in the left foot. This was attributed to her fractured ankle and was soon forgotten when bilateral phlebitis developed and she underwent inferior vena cava ligation. The hip spica was reapplied and the symptoms persisted. The patient complained of a sensation like "rats gnawing at her feet" and soon noted the pain ascending up the leg and finally involving the leg and left hip.

When seen the patient had a causalgic type of leg pain. A left paravertebral lumbar sympathetic nerve block was done at the L2, 3, 4 and 5 levels. The block became evident within fifteen minutes, with an increase in temperature of the foot and a sensation of throbbing in the left limb. However, there was no relief of pain. An x-ray series of the fractures revealed a residual deformity with the femoral head somewhat posterior in relation to the acetabulum. A shadow on the ilium was thought to be a fragment from the acetabulum.

With the physical and x-ray findings, the sciatic nerve was explored. The nerve was exposed from its notch exit to below the trochanters. Gluteal atrophy was immediately noted, and under the muscles the nerve was found to be bound down by fibrotic adhesions. The head of the femur was still posterior to the acetabulum. A large fragment from the acetabular rim was displaced posterior to the ilium. Riding across the medial, sharp edge of this fragment was the fibrotic nerve trunk. The wedge-shaped fragment was chiseled off and the nerve was freed its entire length from the sciatic notch to below the femoral neck. It was thought that the nerve was fibrotic and beyond complete recovery. The wound healed readily but the pain remained.

On June 3, 1955, chordotomy was performed at the D2 to 4 level. For the first time in ten months the patient was free of left leg pain. Muscle atrophy had been extensive and what recovery can be expected is small. However, the patient can once again move, turn and sit in her chair without crying with pain—most of which, if not all, could have been avoided. At last report she was still free of symptoms and was ambulatory with assistance.

Pilonidal Cyst of the Clitoris

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THE literature is replete with studies on pilonidal cysts of the sacrococcygeal region, including theories of origin, clinical histories, physical findings, operative procedures and postoperative results. In routine surgical practice these cases are frequent. However, a pilonidal cyst of the anterior median raphe is a rarity. There are a few reports on anterior pilonidal cysts in the male, but none can be found on this condition in the female. Indeed, there is almost no literature on the subject. The question of whether the condition does frequently come to the attention of surgeons and goes unreported may be answered by the response of readers to the case reported herein.

The divergence of opinion in regard to whether certain lesions should be called pilonidal cysts, dermoid cysts or epithelial inclusion cysts is acknowledged by the author. However, a lesion with the characteristics to be described is presented as an anterior pilonidal cyst because the findings conform to the general characteristics of posterior pilonidal cysts.

CASE REPORT

H. D., a twenty-nine year old unmarried woman, was first seen on November 14, 1947, complaining of pain in the pubic area. Symptoms were very recent (only four days' duration) and had occurred at the end of her most recent catamenia which had just been completed. At some indefinite time before there had been slight itching in the same area, but no pain. The onset of pain was sudden and the pain was severe. She reported to the nurse on duty at her place of employment the day before she consulted me, and again on the day of her first visit to me. A dressing of boric ointment was applied and the patient was advised to seek medical attention. In the days between the onset and the first visit there had been a moderate amount of creamy yellow discharge. Past history is irrelevant. The patient was usually well and healthy. She had begun to menstruate at twelve years of age. Menstrual functions had been irregular until she was twenty-three years of age, when the interval became established at twenty-six to twenty-eight days. She did not complain of dysmenorrhea and intercourse was denied.

Physical examination revealed a tall, well developed, intelligent but reticent woman who had had no previous illnesses to necessitate examination for female disorders. As she entered the office it was noted that she walked slowly and with a straddling gait. Local examination revealed a massive inflammatory reaction in the area of the clitoris and the surrounding soft parts, including adjacent areas of the labia minora and the lower part of the mons veneris. The skin was red and the entire area was so sensitive that adequate examination was not possible. She was given medication for the relief of pain and told to use continuous hot packs. The following day she was much relieved. The area was draining more freely and no fluctuation or pointing was noted. A working diagnosis of non-specific infection of the clitoris and surrounding soft parts with abscess formation was made. Sulfadiazine was prescribed. No culture was taken.

Three days later she was seen again. In the interval an abscess had formed and then ruptured with discharge of blood and purulent material. More definitive examination was possible. The skin over the mons veneris was reddened and the glans clitoris was bright red with sanguineous, purulent drainage oozing from the tip of the glans. Again, three days later (seven days after her first visit) the suprapubic swelling and redness had almost disappeared. The shaft of the clitoris could be readily distinguished on palpation. Its caliber was irregular and it was very tender. To the amazement of the examiner, something which

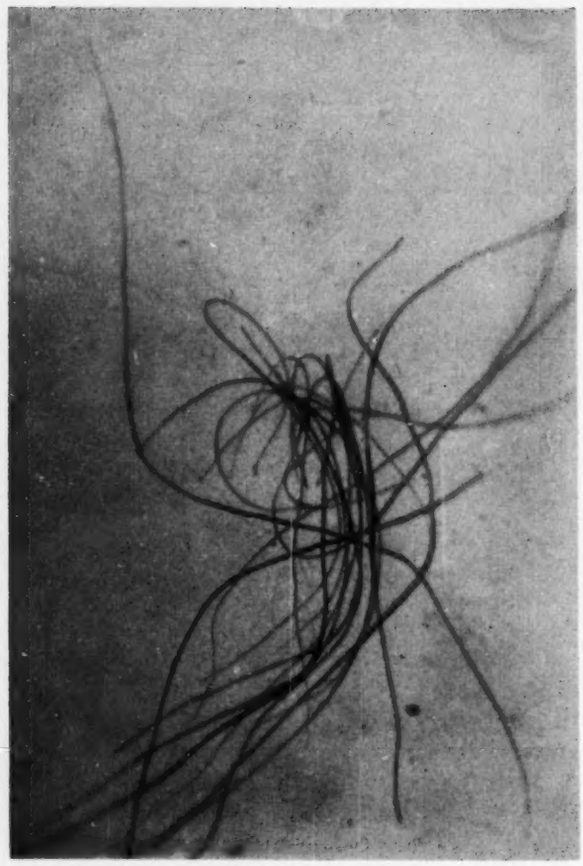

FIG. 1. Hairs removed from an opening at the tip of the glans clitoridis bundled together lengthwise by thick purulent material, giving the appearance of a piece of string.

resembled a piece of string was seen issuing from an opening at its tip. This object was carefully extracted and examined. The mass proved to be a bundle of fine, reddish blond hairs held together in a neat group by sticky mucoid discharge. A diagnosis of infected pilonidal cyst of the clitoris with draining sinus was considered. (Fig. 1.)

Hospitalization for surgery was urged but the patient refused. One week later the infection had completely subsided. A vague, dull ache at the site of trouble was all that remained of the patient's symptoms.

Eleven months later on October 16th, 1948, the patient again appeared at the office. Three days previously the suprapubic area and vulva were again sensitive and becoming increasingly painful. Examination revealed that the entire area was swollen, hard and red. Hospitalization for surgery was eagerly accepted.

Operation was performed on October 18, 1948, spontaneous drainage having occurred the night before. At operation it was noted that the acute swelling of the soft parts in the area of the clitoris had subsided. A point of rupture was evident in the epithelium covering the clitoris, 1.5 cm. proximal to the glans. The aperture was 0.75 cm. in diameter and its margins were hemorrhagic. A probe inserted into the opening passed upward within the shaft of the clitoris for a distance of 2.5 cm. The labia were normal. The urethral meatus was small and not inflamed. The hymen was unruptured but sufficiently pliable to permit digital examination. The cervix was posterior and of moderate size without erosions. The fundus of the uterus was movable and of normal size with no adnexal masses.

With the probe in the opening of the sinus, a midline incision was made, 3 inches in length, starting in the hair-bearing area of the mons pubis, continuing downward to the perforation and encircling it. The incision was then returned to the midline and carried down to the tip of the glans. The folds of the labia minora forming the praeputium clitoridis and the frenulum clitoridis were encircled with the incision so as to preserve them for precise closure. This permitted the glans clitoridis to slip free. The margins of the entire incision were grasped with Allis clamps and the skin undermined. Subcutaneous tissues were dissected out *en masse*, together with the entire shaft of the clitoris, suspensory ligament being severed. The dense, fibrous coat of the shaft posteriorly was included. When the entire mass had been dissected out, a smooth triangular bed of glistening fascia remained. Interrupted mattress sutures were used to approximate the subcutaneous tissues remaining on the reflected skin margins. These sutures were anchored to the free margins of dense fascia in the median raphe to obliterate dead space, similar to closure of a posterior pilonidal sinus. The skin was closed with interrupted black silk sutures. A cigarette drain was placed in the soft tissues at the top of the wound with exit toward the lower pole but anterior to the reconstruction of the anterior ends of the labia minora. The mucous membrane of the praeputium clitoridis was also approximated with black silk to reconstruct the anterior angle of the labia minora. The full report of the pathologist was as follows: "Gross: The specimen consists of a shaft of a clitoris and includes the glans clitoridis.

FIG. 2. Canal within clitoris, at some levels lined by an orderly layer of stratified squamous epithelium deep to which there are numerous hair-bearing follicles, hair shafts and sebaceous glands.

The specimen is roughly cylindrical in shape, measuring 4 cm. in length and averaging 2 cm. in diameter. The sides are formed by roughened fibrous tissue while the glans clitoridis is convex and formed by smooth, red-brown mucous membrane. In the center of the glans is an aperture measuring 0.3 cm. in diameter. A probe can be inserted easily into the shaft of the clitoris for a distance of 2.7 cm.

"Without further examination the specimen is placed in fixative. After fixation and the accompanying shrinkage of tissue it is noted that a tuft of about ten stiff brown hairs protrudes outward at right angles to the axis of the clitoris and 0.5 cm. posterior to the glans. Gross sections are made at intervals through the shaft revealing an irregular canal measuring 0.7 cm. at its greatest diameter extending through the shaft, the canal being widest in diameter at its posterior extremity. The lining of the canal is rough and irregular and the hairs, previously mentioned, can be seen arising from the wall.

"Microscopic diagnosis: Pilonidal cyst of clitoris; acute inflammation of clitoris. Microscopically, at some levels, the canal within the center of the clitoris is formed by very vascular granulation tissue with an acute inflammatory

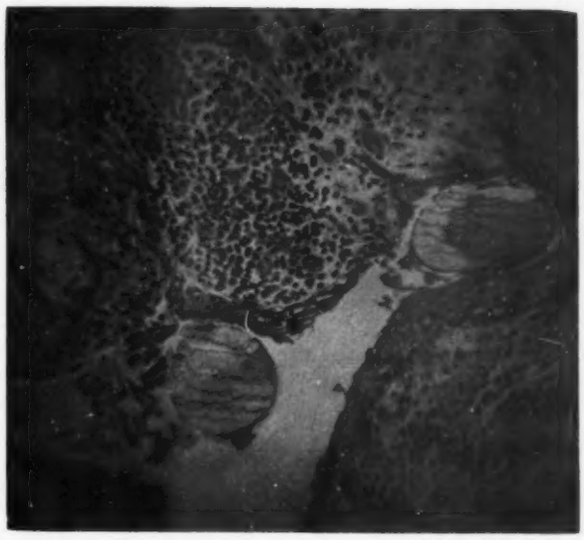

FIG. 3. Detail of hair shafts in the canal.

reaction throughout, evidenced by infiltration with polymorphonuclear leukocytes, lymphocytes and plasma cells. At other levels the canal is lined by an orderly layer of stratified squamous epithelium, deep to which there are numerous hair follicles, hair shafts and sebaceous glands." (Figs. 2 and 3.)

It is interesting to note that it was infection which first brought the underlying cyst to the attention of the patient and surgeon, as is the situation in many, if not most, coccygeal pilonidal cysts.

The patient's postoperative course was smooth and she was discharged on the sixth postoperative day. On December 4, 1948, approximately seven weeks after she was discharged, the wound was completely healed.

In April, 1949, an unrelated complaint brought the patient to the office. She had had no recurrence of the cyst or inflammatory reaction. The operative area was re-examined and found to be in excellent condition. The patient was married in May, 1951, and a daughter was born in June, 1953. Pregnancy and delivery were uncomplicated. There was no recurrence of symptoms relative to the cyst.

REVIEW OF LITERATURE OF CYSTS OF CLITORIS

The literature has been reviewed and, after diligent search, three main studies of cysts of the clitoris constitute a fairly comprehensive report on the subject. All writers state that literature on the subject is scant.

In Great Britain Swanton[1] reports on a

dancer who had a painful swelling of the clitoris after trauma while doing a "cobbler dance." The mass was "tapped" with escape of thin, grayish fluid with a faint odor. Recurrence of pain and swelling led to subsequent definitive surgery. The mass was dissected out *en masse*, incisions being made from the suspensory ligament to each labium minus, these incisions being connected by a transverse incision across the vestibule. The specimen was a thick-walled, oval cyst, 1½ by ¾ inches, the wall being 3/16 inch at its thickest portion and diminishing to a membrane at the thinnest part. The inner surface of the wall of the cyst was hemorrhagic and rugose with traces of septums. The walls were made up of laminated layers of connective tissue with vascular spaces and inflammatory cells; there was no trace of a distinct lining membrane. Swanton's differential diagnosis included dermoid cyst, fatty tumor, sebaceous cyst and chronic abscess. His final impression was sebaceous cyst with recent suppuration.

From France[2] comes a report of a large bilocular cyst which developed in the stump of the clitoris left after incomplete extirpation of the clitoris during the ritual of circumcision of female infants in Moslem countries. It is believed that resulting remnants of epithelium may be buried *in situ* when the bleeding is stopped by forceful rubbing and pressure. Epitheliomas are not infrequently observed but non-malignant tumors at this site are rarely seen, although they may occur without being brought to the attention of surgeons. A thirty-five year old woman who had been married at the age of twelve, did not menstruate until twenty-two years of age and had never become pregnant presented herself to Drs. Diamantis and Onsy of Cairo for treatment of an oblong tumor in the region of the clitoris. It obscured the urinary meatus and jutted over the brim of the pelvis. The mass was the size of a large chestnut, not adherent to the skin, but adherent to the deeper tissues. The tumor was composed of two cysts, a large one with a smaller one overhanging it, similar in character and filled with a viscous liquid but not hair, bone or sebum. The lining was of tessellated epithelium and the walls were formed of tissue identical to that of the clitoris with some inflammatory reaction.

A German study by Stukowski[3] reviews the scant literature and gives some general observations. He reports a case of a sixty-five year old woman who was hospitalized following a cerebral accident with an incidental finding of a cyst anterior to the urethra. The cyst was large, 11.4 by 14 by 14 cm., fluctuant and contained clear, mucoid, sticky fluid. Histologically the cyst was lined with cuboidal epithelium.

ANTERIOR PILONIDAL CYSTS

Smith[4] mentions the thousands of cases of pathologic hair-bearing cysts seen in the midline coccygeal region, but remarks that it is difficult to think of a pilonidal cyst occurring in any other site. He reported four cases in which pilonidal cysts were located in the perineum. These four cases were differentiated from anterior anal fistula by bacteriologic study of the exudate, instillation of methylene blue (which did not enter the rectum) and study of the tissue removed *en bloc* at operation. Hair was found in the cavities, and microscopically the structure was the same as in coccygeal pilonidal cysts. These anterior pilonidal cysts are not to be confused with postrectal or presacral dermoid cysts.

SUMMARY

The literature on cysts of the clitoris, which so far as this writer can determine is very scant, has been reviewed. One case of a pilonidal cyst of the clitoris has been reported herein, in the belief that it is the only one recorded in the literature to date. Reference has been made to cases of anterior pilonidal cysts in the male. Discussion as to the theory of the origin and development of pilonidal cysts, both posterior and anterior, is not within the scope of this article. It is hoped that if cases of pilonidal cysts of the clitoris are known to readers of this article, they will be called to the writer's attention and that further studies of the origin and cause of these anterior pathologic developments will result.

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Non-specific Ulcer of the Small Intestine

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NON-SPECIFIC ulcer of the small intestine is a rare disease of unknown etiology. The clinical picture is readily confused with other disease entities so that a correct preoperative diagnosis is rarely achieved. It is believed that the case report presented herein will contribute to the meager body of knowledge on this subject and at the same time serve as a reminder of an additional lesion capable of resulting in massive gastrointestinal hemorrhage.

CASE REPORT

P. F., a forty-eight year old man, was admitted to the surgical service of the Mt. Sinai Hospital on August 23, 1953, with the complaints of weakness and faintness. He had passed three tarry stools in one hour shortly before admission. He described three entries to this institution with similar complaints eighteen months, nine weeks and five weeks prior to this admission. On each occasion thorough study failed to disclose the source of hemorrhage, and bleeding ceased spontaneously after adequate transfusion therapy. Abdominal pain, vomiting or hematemesis had never occurred. The patient admitted to heavy alcoholic intake before 1945 but to none since that time.

Examination revealed a pale, well developed, well nourished man who did not appear ill. Blood pressure was 118/68, pulse 80, respirations 18 and rectal temperature 99°F. There were no skin telangiectases. The heart and lungs were normal. The abdomen was soft and flat; no tenderness or masses were present. The liver and spleen were not palpable. Rectal examination was negative except for tarry stool on the finger specimen.

Laboratory data were as follows: The hemoglobin was 8.2 gm. Thorough survey by the hematology department failed to reveal evidence of a blood dyscrasia. There was no blood in the gastric aspirate. Stool specimens were repeatedly strongly positive for occult blood. The electrocardiogram was normal.

Esophagram and barium meal studies demonstrated a small hiatal hernia. Gastroscopy gave a negative result as did a small intestinal series, a barium enema and x-ray of the chest.

Following the administration of 3,500 cc. of whole blood, hemorrhage ceased spontaneously. It was the belief of the surgical service that this patient had adequately demonstrated dangerous intractability and that exploratory laparotomy was indicated even in the absence of a definitive diagnosis.

Operation was performed on September 8, 1953, through a right rectus incision. Examination of the lower esophagus, stomach, duodenum, gallbladder, liver and spleen revealed no abnormalities. The small bowel was normal from the ligament of Trietz to a point approximately 18 inches proximal to the ileocecal valve where a 3 inch segment of ileum was felt to be indurated. The serosa overlying this area was pale. The adjoining mesentery was normal and contained no enlarged lymph nodes. The indurated segment of ileum was resected and continuity re-established with end-to-end anastomosis.

The surgical specimen consisted of a portion of terminal ileum measuring 10 cm. in length. The serosal surface was partially covered with fat. There were several rough granular areas surrounding dilated blood vessels. The mucosal surface was smooth and the lumen was not narrowed. There was an annular ulcer almost completely encircling the bowel wall. (Fig. 1.) It measured 3 by 1.5 cm. and was shallow in depth. The edges of the ulcer were sharp, without elevation or induration and the surrounding mucosa was hyperemic. The base of the ulcer was granular and hyperemic, and three very small blood clots appeared to be occluding the mouths of blood vessels which

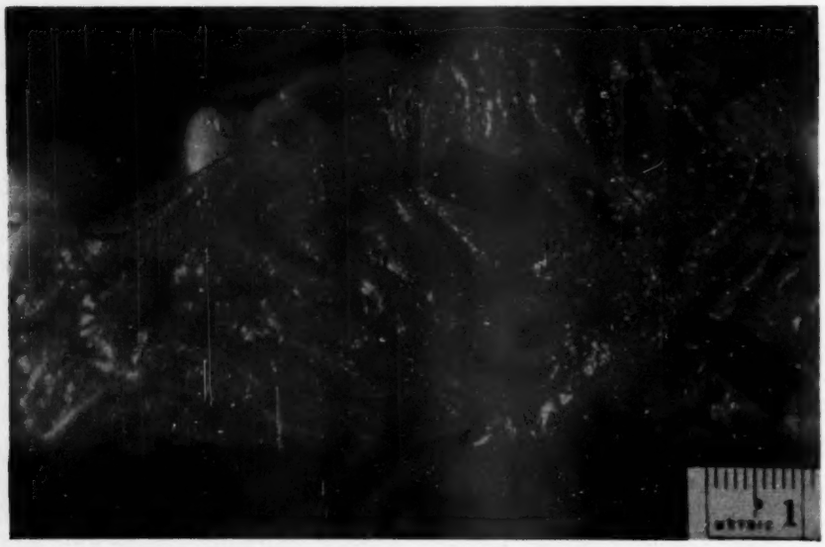

FIG. 1. The arrows outline the shallow ulcer which almost completely encircles the wall of the small intestine.

were surmised to have been the source of the bleeding. There were no enlarged or altered lymph nodes in the mesentery.

The microscopic picture was that of a non-specific ulcer of the ileum extending to the submucosa. There was no evidence of aberrant gastric mucosa, tuberculosis or regional enteritis. (Fig. 2.)

The patient had an uneventful postoperative course and was discharged on the tenth post-operative day. The last follow-up interview eleven months after operation revealed no evidence of recurrence of the hemorrhage.

COMMENTS

Non-specific ulcer of the small intestine was initially described by Bailie in 1805. Combes[2] collected thirty-six case reports of primary ulcers of the small and large intestines in 1897. Morrin,[3] in 1931, collected eighty-five such cases, and in 1948 Evert, Black and Dockerty[1] collected an additional forty-five cases including fourteen from the Mayo Clinic. In 1951, Shea[4] presented five cases.

The etiology of this disease is unknown. Infection, trauma, vascular abnormalities and aberrant gastric mucosa with or without associated Meckel's diverticulum have been incriminated as possible etiologic agents.

The condition occurs more often in males in the ratio of 3:1. The youngest patient was twelve months old and the oldest, seventy-seven years old. The average age of reported patients was forty-three years.[1]

Grossly, the ulcer is usually single, punched out and has a smooth base, varying in diameter from 3 mm. to 2.5 cm. or more. The bowel adjacent to the ulcer is usually normal. Scarring from a chronic ulcer may cause stenosis. The terminal ileum and the proximal jejunum are the usual sites for non-specific ulcer.

Microscopically, the base of the ulcer is covered with a thin layer of fibrin and leukocytes. More deeply, the muscularis mucosae is replaced by granulation tissue and is infiltrated with plasma cells and lymphocytes. Varying involvement of the muscle layers with connective tissue is also present. The inflammatory reaction only rarely extends beyond the actual ulcer itself. Acute ulcerations without much fibrosis may occur, but chronic ulcers are more usual.[1]

The presenting clinical picture depends upon the complications. As with the case presented herein, recurrent exsanguinating hemorrhage may bring the patient to the physician. Sudden severe abdominal pain with the picture of a perforated viscus may be the first sign, but often there has been a history of chronic recurrent undiagnosed abdominal pain prior to the acute episode. When cicatricial stenosis has occurred, intermittent, crampy, abdominal pains with vomiting may follow. The only findings in some patients may be anemia with persistent occult blood in the stools. Everts,

Black and Dockerty[1] found that 81 per cent of reported non-specific ulcers perforated, 15 per cent bled and 9 per cent were obstructed.

The diagnosis is only occasionally made in those patients with an acute onset, and the symptoms are usually so obscure in the chronic type that a correct preoperative diagnosis is only rarely attained. Radiologic demonstration of the lesions is difficult but those with constriction may be revealed by a barium meal study.

The diagnosis of non-specific ulcer of the small intestine depends in large measure upon a high index of suspicion when more common disease entities have been ruled out. It should be considered in patients with gastrointestinal bleeding, acute or chronic, in whom x-rays reveal a normal esophagus, stomach, duodenum and colon. Suspicion should be aroused in patients with recurrent abdominal pain suggesting a peptic ulcer, but in whom no evidence of gastric or duodenal ulceration can be found. At operation for a ruptured viscus, when the stomach and duodenum are found to be normal, the small bowel should be carefully explored.

The treatment of non-specific ulcer of the small intestine is surgical. For acute perforations, transverse closure of the ulcer is the simplest procedure in a seriously ill patient with peritonitis. Resection of the involved area is probably the better procedure and should be performed for perforation if the risk is not prohibitive. Resection with end-to-end anastomosis is the procedure of choice in those patients with obstruction or bleeding.

The mortality rate has been reported as high. There were twenty-one deaths in the series of forty-five cases reported by Everts, Black and Dockerty,[1] giving a mortality rate of 47 per cent.

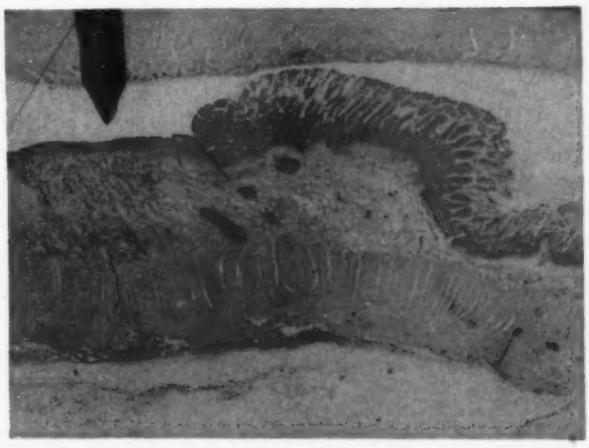

FIG. 2. Photomicrograph of a section through the ulcer demonstrating the well defined mucosal margin. The base of the ulcer lies on the intact submucosa.

SUMMARY

A case of non-specific ulcer of the small intestine is presented as a cause of recurrent massive hemorrhage. The literature on this subject is reviewed.

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Paget's Disease of the Anus

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There has been a great deal of controversy as to whether Paget's disease is autochthonous or metastatic from underlying glandular carcinomas. Although the large majority of authors agree to the latter concept, additional cases which can prove the theory of metastasis should be welcome since there is further need for verification and amplification of these studies. In 1952 Dockerty and Pratt[4] published an excellent review of extramammary Paget's disease and added four cases, two of the vulva and two of the anus. The authors proved the metastatic nature of the entity by the presence of mucus in the glands and signet-ring cells of the epidermis, and in the underlying glandular carcinoma.

We are presenting one case of extramammary Paget's disease of the anus with an underlying mucus-producing adenocarcinoma of the apocrine type and with mucus-producing Paget's cells within the epidermis. It is the eighth case of Paget's disease of the anus to be reported in the literature.

CASE REPORT

The patient was a sixty-two year old white man who had undergone transurethral resections in 1935 and again in 1942. In 1944 he had been treated for angulation of the right ureter, hydronephrosis and Hunner's ulcer of the urinary bladder. During a routine examination in 1948 his urologist noted several tiny anal tags which were somewhat thickened and the patient was referred to the surgical department. He stated that he had first noted the small protrusions about his anus nine months previously. His attention had been called to the anal tags because there had been a discharge of mucus from his anus which had caused his

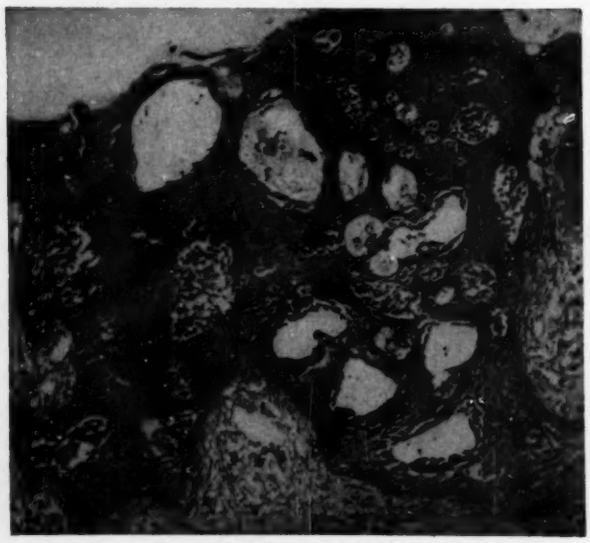

Fig. 1. Numerous Paget's cells and extension of a mucus-producing adenocarcinoma in the epidermis. Hematoxylin and eosin; original magnification × 100.

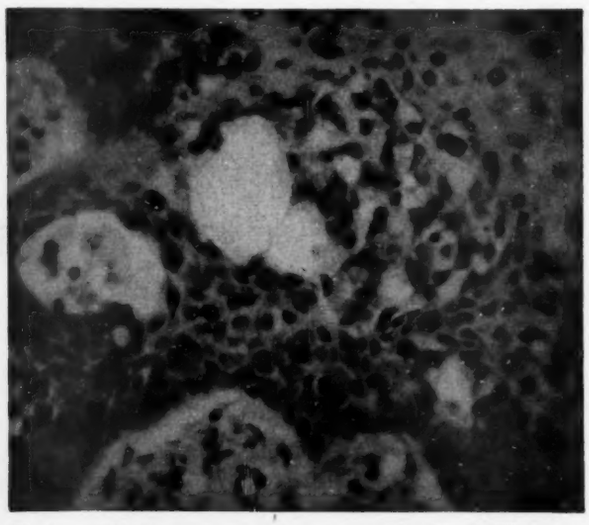

Fig. 2. Higher power photomicrograph of Figure 1 showing a marked pagetization of mucicarminophilic cells and many mitotic figures. Hematoxylin and eosin; original magnification × 400.

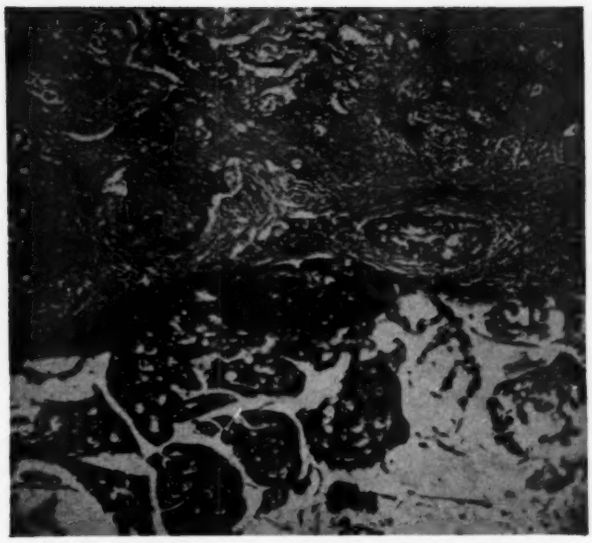

FIG. 3. Paget's cells and mucous glands in the epidermis and the underlying adenocarcinoma, with pools of mucus. A tumor embolus is seen in a lymphatic. Hematoxylin and eosin; original magnification × 100.

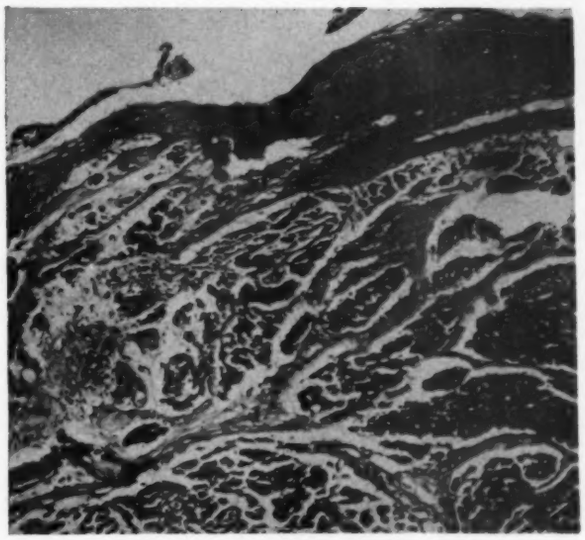

FIG. 4. An area of Figure 3 showing the extension of the underlying adenocarcinoma into the epidermis. Hematoxylin and eosin; original magnification × 100.

clothes to stick. Occasionally he noted blood on the toilet paper if he used too much friction. There had been no pain or change in bowel habits.

General physical examination showed no abnormalities. There were several small skin tags about the anus. These tags were a little thicker than usual. There was no ulceration. Digital examination revealed no abnormality. Anoscopic examination revealed small internal hemorrhoids but no area of ulceration. A proctoscope was inserted to 10 cm. and the mucosa appeared normal. The microscopic findings showed marked acanthosis of the epidermis. Many cells, similar to those of Paget's disease of the breast, were found throughout the epidermis singly and in groups. The cells were large, with large vesicular nuclei and prominent nucleoli. The cytoplasm was abundant and very pale. Many mitoses, some atypical, were seen. A striking observation was the presence of signet-ring cells and a glandular, mucus-producing carcinoma which infiltrated the whole thickness of the epidermis. Signet-ring cells and glands reacted positively to staining for mucin. Silver stain was negative for melanin. (Figs. 1 and 2.)

The patient was admitted to the hospital on December 10, 1948. The area of biopsy had healed well and a proctoscope was inserted to 20 cm. A small polyp was seen at 15 cm. This was biopsied and found to be benign. The mucocutaneous margin was removed for almost the complete circumference of the anus. The sphincter was left intact and the mucous membrane was sutured to the sphincter muscle. The section of this tissue showed one small area of carcinoma.

The patient was followed up quite closely and the sphincter was dilated weekly. The area healed satisfactorily. The patient was again admitted to the hospital and the small mass was excised on March 2, 1949. The lesion seemed to be beneath the mucous membrane and not fixed to it. Microscopic findings revealed an underlying, mucus-producing adenocarcinoma very similar to an apocrine gland tumor with infiltration into the epidermis, as described previously. Some of the lymphatics at the dermal-epidermal junction contained tumor emboli. The operative area healed well

An abdominoperineal resection was performed on April 15th. Gross and microscopic examination of the surgical specimen was entirely negative. The patient had a stormy postoperative course, with fever, nausea and vomiting. Three weeks after the operation he went into shock and died unexpectedly. (Figs. 3 and 4.)

Autopsy revealed multiple pulmonary emboli and a firm node in the left inguinal region which was the size of a golf ball. There was no other evidence of metastases. Microscopic studies of the lymph node showed adenocar-

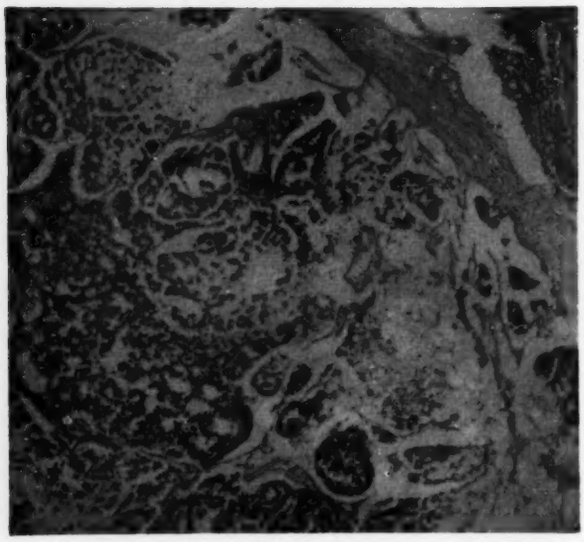

FIG. 5. Metastasis to inguinal lymph node showing marked similarity of apocrine glandular tumor. Hematoxylin and eosin; original magnification × 100.

cinoma of the sweat gland type. Some areas appeared not unlike that found in intraductal carcinoma of the breast. (Fig. 5.)

COMMENTS

Seventeen cases of extramammary Paget's disease of the vulva and eight cases in the anus have been reported in the literature. In most of these cases an underlying apocrine type of adenocarcinoma has been described. We have demonstrated in our case by histochemical technic, as reported by Dockerty and Pratt, that Paget's cells were true signet-ring cells and thus had to migrate into the epidermis from more deeply situated mucus-containing cells of glandular origin. The underlying tumor in our case was a very tiny submucous nodule which was almost missed. This might explain why these tumors are not found in some cases.

SUMMARY

A case is reported of extramammary Paget's disease of the anus, the eighth case to be recorded in the literature. Histologically the findings were identical to the classic findings in the breast. An underlying carcinoma of the sweat gland type, which metastasized to the inguinal lymph node, was also present.

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Rhabdomyosarcoma in Children

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MALIGNANT tumors of striated muscle are rare. The first large series of rhabdomyosarcomas was that reported by Rakov in 1937.[3] Jönsson's study of thirty-nine cases appeared in 1938,[1] and Stout collected 121 cases in 1946.[4] Pack and Eberhart presented 100 new cases in 1952.[2] In all, 230 cases of rhabdomyosarcoma have been reported. Of the 230 cases of this tumor, ten developed in the tongue and twenty-seven in the muscles of the arm, but none in the face. Since these tumors are especially rare in children, our three cases merit reporting.

CASE REPORTS

CASE I. A full term white female infant, spontaneously delivered in September, 1952, had difficulty in breathing at birth. This difficulty was caused by a cystic mass which almost completely occluded her mouth. A tracheal catheter and later a tracheostomy gave temporary relief but death occurred in thirty hours. Autopsy revealed that the large cystic mass was fixed to the floor of the mouth and partially replaced the tongue, pushing it up and out. This mass bulged beneath the skin under the mandible. The tumor proper measured 8 cm. in its greatest diameter. It presented a variegated appearance on section, showing hemorrhage, necrosis and cystic degeneration of pink-gray firm tissue. It infiltrated immediately surrounding structures. The other positive autopsy findings were pulmonary atelectasis and cervical lymphadenopathy.

Microscopically the tumor was cellular and composed of pleomorphic cells with ovoid, hyperchromatic or vesicular nuclei surrounded by a narrow rim of acidophilic cytoplasm. (Fig. 1.) The cells were 10 and 25 microns in diameter and formed clusters with dilated vascular channels and delicate stroma between them. Around the vessels the cells sometimes assumed a non-specific palisaded pattern. Numerous foci of necrosis were present and mitoses were numerous. In some areas the cytoplasm of the cells was more abundant with a fusiform or strap shape. Their nuclei had a finely granular chromatin network and a distinct nucleolus. In rare instances these large cells formed syncytia with faint cross striations characteristic of muscle. Occasional fusiform cells also showed longitudinal fibrillae and some with stellate cytoplasm occurred. The tumor had metastasized to one lymph node.

CASE II. A five year old Negro girl, a native of St. Thomas, Virgin Islands, received a booster dose of alum-precipitated diphtheria, pertussis and tetanus vaccine into the left arm in January, 1953. A mass developed at the site of inoculation, and biopsy in October, 1953, showed embryonal rhabdomyosarcoma. The tumor recurred, grew rapidly and measured 11 by 8 by 6 cm. when removed with the biceps muscle in March, 1954. Roentgenograms at that time revealed no skeletal or pulmonary metastases. In June, 1954, enlarged lymph nodes appeared in the left supraclavicular region but no biopsy was taken. The patient died in November, 1954; no autopsy was performed.

Microscopically the tumor in the first biopsy was cellular with scant stroma and was composed of variable polyhedral cells intermingled with fusiform and strap-shaped cells. Small cells were about 15 microns in diameter while some elongated cells were 150 microns long. Nuclei were ovoid with light chromatin and a nucleolus. Some fusiform cells had a bulge of cytoplasm at one extremity suggesting a racket shape. The cytoplasm was acidophilic, granular and sometimes bright. Longitudinal fibrillae were identified but cross striations

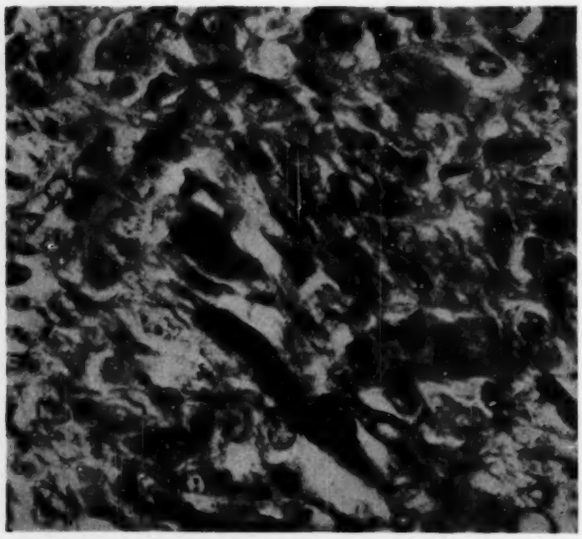

FIG. 1. Case I. Rhabdomyosarcoma in a newborn infant showing anaplastic tumor cells and occasional differentiation to striated muscle. Phosphotungstic acid hematoxylin stain; original magnification × 830.

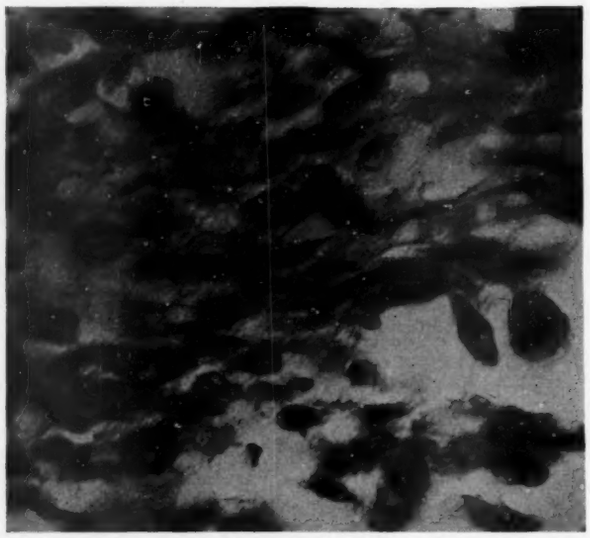

FIG. 2. Case II. Rhabdomyosarcoma in a five year old girl. Phosphotungstic acid-hematoxylin stain; original magnification × 830.

were rare, occurring in the fusiform or strap-shaped cells. Tumor giant cells occurred but mitoses were not common. Necrosis was not conspicuous but focal hemorrhage was. Blood vessels showed proliferation of the intima and some adventitial fibrosis.

The second excision of the tumor showed a change from the first biopsy in the balance of cell types. Although there were cells with longitudinal and cross striations like those seen earlier, the predominant tumor cell was now a primitive, small, oval or polygonal cell with scant slightly acidophilic cytoplasm. (Fig. 2.) The nuclei were more compact, and the cells were approximated, often perithelialy concentrated, as in Case I. Mitoses were moderately frequent but necrosis was scant.

CASE III.* A four year old Portuguese boy was admitted to the Pondville State Hospital in October, 1952, because of progressive swelling of the left side of the face for five months. He experienced pain while chewing and swallowing. The tumor involved the left mandible and was about 6 cm. in diameter. Roentgenograms showed a cystic, destructive tumor of most of the left mandible which extended into adjacent soft tissues. A small biopsy specimen taken from the jaw inside the mouth showed odontogenic epithelium and was at first interpreted as an adamantinoma. Additional sections showed it to represent non-neoplastic tissue distorted by the tumor growth. Left hemimandibulectomy was performed in October, 1952, but the tumor could not be entirely removed. Proptosis of the left eye occurred in January, 1953, and a course of radiation was given over ten days to the temporomandibular region; 2,200 r were calculated to be the tumor dose. The tumor promptly decreased in size and 1,000 r were given in February. In May, 1953, a foul discharge from the left nostril developed and roentgenograms showed that the tumor was destroying the antrum, lateral orbit and zygoma. The 3,500 r given to this tumor region were fruitless and the patient died in September, 1953. Autopsy revealed that a soft but firm reddish gray tumor was infiltrating the bony structures and adjacent tissues previously described and extending into the anterior part of the cranial cavity. The tumor invaded the base of the brain anteriorly and the pituitary gland. Other positive findings were vitiligo of extremities, trunk and forehead with a corresponding patch of white hair in the latter site. There was a slight tracheobronchitis. No distant metastases were present.

Microscopically the outstanding feature of the tumor was the resemblance of much of it to fetal skeletal muscle with which it was specifically compared. (Figs. 3 and 4.) The

* This case and human fetal tissue were made available by Dr. Samuel P. Hicks, Department of Pathology, Pondville State Hospital, Walpole, Massachusetts.

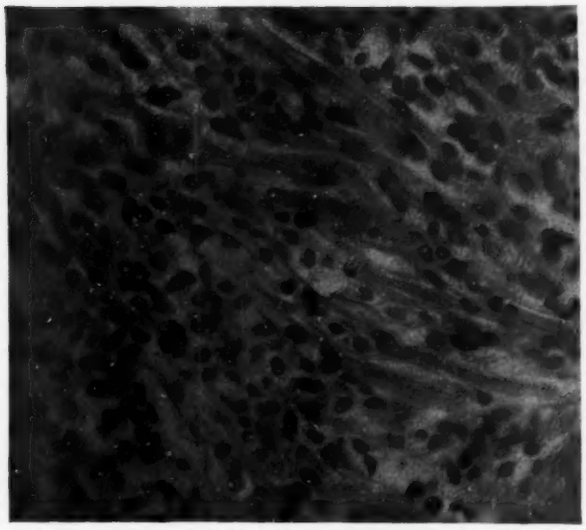

FIG. 3. Case III. Rhabdomyosarcoma in a five year old boy. The tumor recapitulates embryonal and fetal muscle development. Hematoxylin and eosin stain; original magnification × 360.

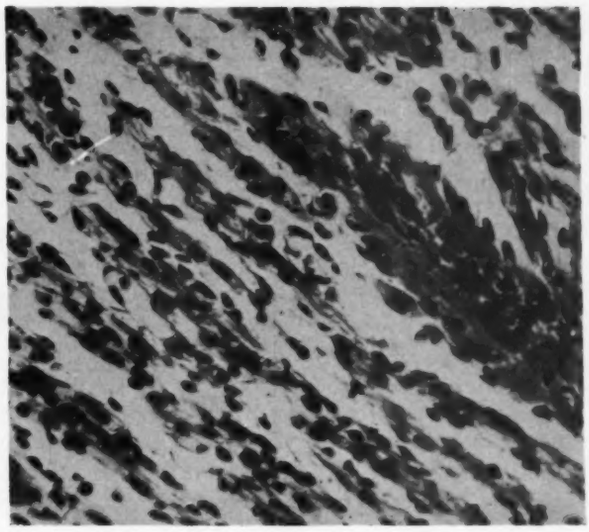

FIG. 4. Case III. Skeletal muscle from a 3 cm. human fetus. Hematoxylin and eosin stain; original magnification × 360.

tumor cells formed a spectrum with two extremes, primitive undifferentiated and fetal type skeletal muscle cells. The latter were elongated, fusiform or strap-like with pink cytoplasm and characteristic cross striations and longitudinal fibrillae. The nuclei were oval and fairly uniform with moderately dense chromatin. They were centrally or peripherally placed as in fetal muscle. The arrangement of these cells was jumbled but in small areas they could almost be superimposed on small areas of normal fetal muscle. Such differentiated tumor cells were interspersed among cells ranging from those resembling elongated embryonal muscle cells with no striations to close-packed undifferentiated little cells with no differentiated characteristics at all. These had compact, oval, moderately chromatic nuclei; scant, slightly acidophilic cytoplasm; and they displayed fairly frequent mitoses. Sometimes these cells were clustered; in other instances they were concentrated around small vessels. Although these shaded into recognizable muscle cells, taken out of context they would not be distinguishable from many types of primitive cells seen in very early embryos or from undifferentiated fetal mesenchyme where muscle is still developing.

COMMENTS

These three cases illustrate rhabdomyosarcomas in children that differentiated in varying degrees only to about the level of fetal muscle. In Cases I and II the tumors were highly anaplastic and although some differentiation occurred, much of the growth was bizarre and scarcely imitated normal muscle development; one metastasized and the other apparently did. In Case III the tumor recapitulated the development of skeletal muscle much more faithfully. Even the most primitive elements were not bizarre as in the other cases, for they still mimicked embryonal patterns of growth to a considerable degree. The growth of the tumor in the brain, relatively free of connective tissue and uncomplicated by normal muscle, demonstrated these levels of differentiation especially well. Despite its local growth this tumor did not metastasize.

Various derivatives of the so-called skeletal blastema, including muscle, may appear in mesenchymal tumors in children and adults. In sarcomas that invade muscular regions, the distinction of residual normal muscle fibers from those that are truly neoplastic is sometimes difficult. In the cases presented herein the differentiation was at a lower level of development (fetal and embryonal), and in the third case the tumor was virtually a pure muscle tumor with no admixture of other mesenchymatous elements.

SUMMARY

Three cases of rhabdomyosarcoma in young children, one present at birth, are presented.

The patterns of growth and differentiation of these tumors are emphasized.

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We recommend:

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The Principles and Practice of Surgical Nursing. By D. F. Ellison Nash, F.R.C.S., Assistant Surgeon, St. Bartholomew's Hospital, London, Eng. 1,007 pages, with 371 figures. Baltimore, 1955. Williams & Wilkins Co. *Price* $7.00 (A satisfactory and valuable text.)

Extensive Sacral Radiation Carcinoma Superimposed on "Bathing Trunk" Nevus

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THE late development of radiation carcinoma is one of the most disastrous results of excessive radiotherapy, and is particularly regrettable when the indication for the original treatment was a benign dermatosis. The occurrence of radiodermatitis or actinodermatitis with its highly pathognomonic atrophy, telangiectasia, pigmentation, hyperkeratoses, ulceration and even necrosis ordinarily precedes the malignant transformation by a rather prolonged latent period of ten, twenty or even thirty years or more. The duration of this latency is generally inversely proportional to the severity of the reaction, so that as a rule the more marked the radiation effects the shorter the latent period.

Basal as well as squamous cell epitheliomas may occur together or separately, and sarcomas of the underlying structures have also been reported. The classic example of a radiation sarcoma is the osteogenic sarcomas that once mysteriously developed in the painters of radium dials. Radiation carcinoma is characterized by its inherent multicentricity as one area after another tends to break down, emphasizing the prophylactic importance of as com-

FIG. 1. Thirty-seven year old woman with extensive chronic actinodermatitis of gluteal and lumbar regions with squamous cell epithelioma overlying sacrum. Residual pigmented nevus visible on thighs. Right thigh is small; note "muscle hernia" below gluteal fold.

FIG. 2. Same patient as in Figure 1. Preoperative close-up of the malignant sacral ulcer. The deeper, punched-out area of the right border is the site from which the recent biopsy specimen was taken.

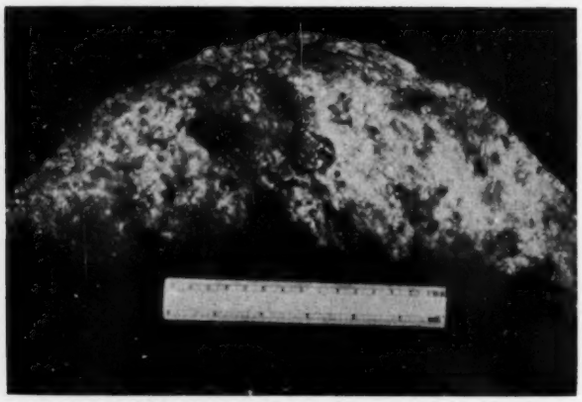

FIG. 3. Surgical specimen, outer surface, with central ulceration and surrounding chronic radiation scar.

FIG. 4. Surgical specimen, under surface. Note sacral muscles beneath mid-portion.

FIG. 5. Microscopic section revealing typical hornifying squamous cell epithelioma.

plete removal as possible of the hopelessly damaged skin. In chronic, irreversible cases, medical therapy is ineffectual, and radical surgical removal of the radiated skin is necessary. Undue exposure to strong sunlight or further radiation probably hastens the rate of conversion of x-ray dermatitis into a malignant process.

In the employment of heavy radiation therapy in infants and children, the possibility not only of localized growth arrests but also of permanent epilation and radiation carcinoma appearing later must always be considered. Should frank actinodermatitis develop in a child, excision, resurfacing and plastic repair of the involved area is strongly indicated at an early date to prevent its subsequent malignant transformation.

CASE REPORT

A thirty-seven year old white nulliparous woman, when only five years old, received an unknown amount of radiation treatment in Central Europe for a pigmented, hairy "bathing trunk" type of birthmark or nevus which involved not only the posterior, inferior trunk but also a considerable portion of the right lower extremity as well. Small, scattered, brown, hairy patches were also present on the forearms. The radiation treatment had been given more than thirty-two years previously, apparently to epilate the lesion. This was accomplished but chronic actinodermatitis developed which was a source of considerable discomfort to the patient because of excessive dryness, tightness and scaling of the skin. As she grew older the skin began to break down, particularly over the bony prominence of the sacrum. For two years prior to surgery a persistent, slowly enlarging sacral ulceration had been present for which numerous forms of local therapy were tried without improvement. (Fig. 1.) Biopsies on several occasions had been reported as negative. Finally repeat, multiple (three) biopsies were taken from various areas of the lesion; two revealed unequivocal squamous cell epithelioma and the third gave a negative result. Preoperative roentgenograms of the sacrum revealed normal bony structures.

The malignant ulcer was roughly circular (Fig. 2), about 8 cm. in diameter with an indurated border and irregularly granular base, and was surrounded by the typical scarring of radiodermatitis in the gluteal and lumbar re-

FIG. 6. Appearance of patient about one year postoperatively. Note "seams" of grafts and some reduction in vertical height of gluteal cleft.

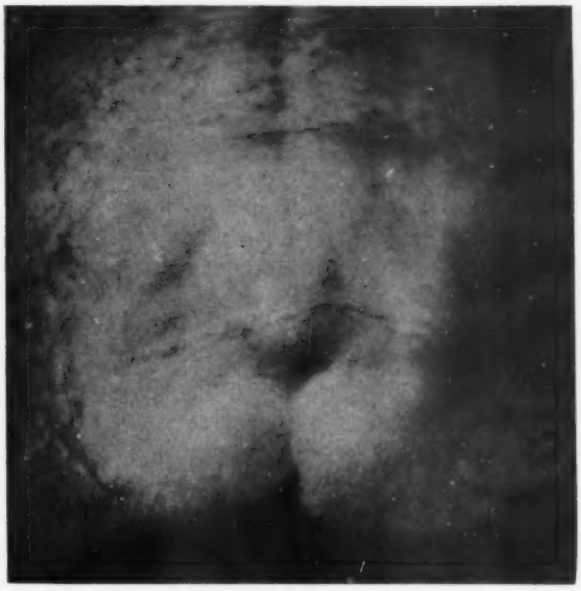

FIG. 7. Close-up of grafted area. Note clearly visible sacrum.

gions with evidence of residual nevi on the thighs. The right thigh was noticeably smaller than the left and presented a "muscle hernia" below the gluteal fold. Except for a resistant secondary anemia (radiation bone marrow effect?) for which the patient had been under treatment for many years, there was no other significant finding; the inguinal nodes were not palpably enlarged.

On October 26, 1954, under general anesthesia the sacral ulceration along with a wide area of the surrounding actinodermatitis was excised *en bloc*, the dissection beneath the ulcer extending down to the sacral periosteum which did not appear involved. The surgical specimen measured 40 by 11 by 1.2 cm. (Figs. 3 to 5.) Closure of the surgically created defect, almost the width of the patient, required three dermatome drums of split-thickness skin graft removed from both infrascapular and left posterior regions of the thigh. Very extensive undermining with approximation of the lateral angles of the wound was performed to reduce the area that needed grafting.

The three separate grafts were sutured to the margin of the wound and to each other, and were further anchored to underlying soft tissues, when available, by "basting" stitches. The grafts were immobilized over aureomycin ointment gauze by the usual type of bolster dressing of fluffed sponges and mechanic's waste, secured by circumferential sutures. The patient received 2 pints of blood during surgery and several pints during the postoperative period to correct a persistent anemia. A Foley retention catheter was inserted into the bladder. Following surgery the patient remained strictly on her abdomen for several weeks, and was placed on constipating medication to minimize contamination of the grafted areas and to obviate any disturbance that early use of the bedpan might have entailed. Antibiotics were prophylactically administered and although the patient was somewhat uncomfortable because of the constantly maintained prone position, relatively little pain was experienced. A change of dressing on the tenth postoperative day revealed a very satisfactory "take" of the grafts at which time the Foley catheter was removed. Because of movement in the donor areas complete healing there required four to six weeks.

Periodic rechecks on the patient have revealed no evidence of recurrence up to the time of writing, more than one year postoperatively. (Fig. 6.) Grossly and microscopically there appeared to be an adequate margin of clearance on careful pathologic examination of the excised specimen. The patient is able to walk, sit and lie down on her back without discomfort. The grafts over the sacrum have shown no tendency to break down, and the entire grafted

area has become increasingly relaxed and pliable. (Fig. 7.) She is, of course, taking special precautions to avoid trauma to the sacral area by using, for example, an air mattress, protective ointments and extra padding in her clothes.

Rotation flap repair of the postsurgical defect was considered inadvisable because of the lack of available donor sites in the immediate vicinity due to widespread radiation damage or presence of nevus tissue. The use of abdominal tubed pedicle flaps likewise would have required multiple stage procedures over a prolonged period of time with the ever present danger in flap reconstruction of concealing recurrences while they become inoperable. With split-thickness skin grafting a satisfactory one-stage resurfacing was achieved with the additional advantage that recurrences could be more readily detected than from beneath a thick flap. Since not all of the radiated skin has been removed this patient should be kept under continuous observation for the future development of any further radiation carcinomas.

SUMMARY

The case presented is that of a thirty-seven year old woman with an extensive, squamous epitheliomatous sacral ulcer which appeared thirty-two years after radiation treatment of a benign, hairy "bathing trunk" nevus. Present therapy consisted of wide and deep excision down to the sacral periosteum with primary, one-stage repair with split-thickness grafts. There is no evidence of recurrence more than one year postoperatively.

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LETTERS TO THE EDITOR

BOTH the excellent article by Dr. Louis Sachs entitled "Closure of the Peritoneum in Vertical Upper Abdominal Incisions" (*Am. J. Surg.*, 90: 673–675, 1955) and the Letter to the Editor by Dr. Hermann Shann (*Ibid.*, 91: 306, 1956) stress technical aspects of abdominal wound closure and suggest that failure of such technics is primarily responsible for later wound disruptions. Dr. Shann recommends the use of through and through interrupted heavy silk sutures which he "ties tightly" and which are removed in ten to twelve days when they "become somewhat loose" (cut through the enclosed tissues) as a guarantee against later wound dehiscence.

The prevention of dehiscence in any wound undoubtedly depends as much on adherence to basic concepts of wound healing as to any technical considerations at the time of operation. The wise selection of incision, preoperative preparation, intestinal intubation to avoid or control distention, blood replacement, attention to nutritional status, etc., are of prime importance. If these matters are attended to, it probably makes little difference what suture material is employed in wound closure and whether or not stay sutures are used. The use of heavy suture materials or stay sutures is certainly not necessary to prevent dehiscence of abdominal wounds provided that the wound is anatomically closed in layers without tension and that proper attention is given to the general management of the patient.

I believe that the emphasis on technic at the time of operation is unwarranted and that stay sutures may lead to a false sense of security with insufficient attention being given to the less obvious and equally important factors mentioned heretofore.

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Bryn Mawr, Pennsylvania

I WISH to make known to the medical profession a newly observed cause of persistent epigastric pain. The most realistic way to do this is to describe a personal experience which took place in November, 1954, for probably other doctors have unwittingly had similar experiences.

One evening I had a moderately severe, boring pain deep in the abdomen in the epigastric region. I recognized it as pain due to spasm of the pancreatic duct, the spasm being caused by irritation set up by duodenal contents or possibly by bile which had seeped into the duct. To expel the invading fluid, as described in a previous article,* I relaxed my abdominal muscles and with my fingers made deep pressure from left to right across the epigastrium. The pain did not suddenly disappear as expected, nor did it disappear after such pressure repeated occasionally. An electric heating pad had no effect. After this deep, boring pain had continued with slight variation for approximately one hour, I called a well informed physician-surgeon. I told him I thought the pain was caused by spasm of the pancreatic duct. He said he never heard of such a thing and ridiculed it, advising me to go to the hospital where I could be prepared for operation if necessary. I asked him to give me an injection of demerol® and he strongly opposed it but did give the injection on my insistence. After two or three minutes the spasm relaxed and I was so much relieved that I went to sleep. The next morning I had no pain.

There is a marked difference between this case and those described in my previous article, for the pain was not ended by massage. That

* BARNES, G. E. Massage in the treatment of diseases of the bile passages, pancreas and vermiform appendix. *Internat. Clin.*, pp. 65–76, March, 1915.

fact seems to indicate that the pain was not caused by invading or locally formed fluid, although there is a possibility that it was. There is no doubt in my mind that the pain was caused by spasm of the pancreatic duct but I do not know the etiology of the spasm. Perhaps it was caused by some disturbance in the vegetative nervous system. My system was disturbed at that time because of illness in my family.

Two or three months before this experience I had examined a stranger who, I decided, had pain which was caused by persistent spasm of the pancreatic duct. I did not venture to treat him but did advise hospitalization for observation and surgery if necessary. He refused and I have not heard of him again.

Since my former article was published forty years ago I wonder how many doctors in treating cases of epigastric pain have thought of spasm of the pancreatic duct and have stopped the pain by massage along the duct.

What is the relation of this condition to acute pancreatitis?

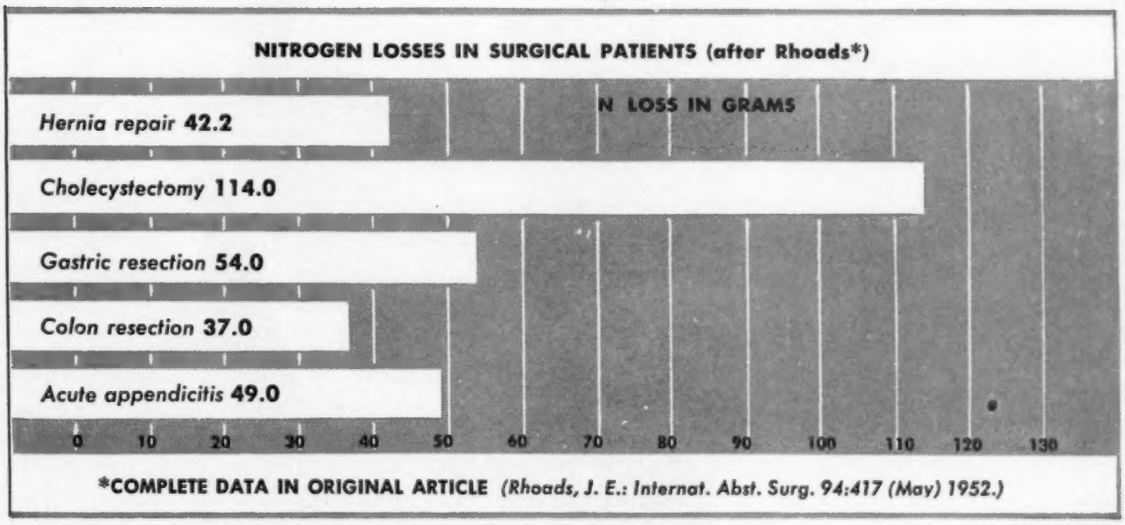
Soon after the publication of my former article I devised a simpler method of making pressure on the gallbladder to empty it: Take a deep breath, contract the abdominal muscles, place forearms on the edge of the lower ribs and place overlapped wrists and hands on the epigastrium and edge of the ribs. Then bend forward while holding full breath and contracted abdominal muscles and pressing inward with arms and hands. Fluid and sediment will squirt out of the gallbladder. This is the only treatment needed in many cases of gallbladder disturbance, especially in cases in which there is no evidence of calculi (negative x-rays, absence of colic and jaundice). If before being thus evacuated cholecystitis has sufficiently thickened the mucous membrane, there are apt to be occasional attacks of retention and sensations in the gallbladder, and the same process of emptying is indicated, even over many years. Of course, an increase of fat in the diet encourages desirable normal emptying of the gallbladder.

An obese, seventy-nine year old woman had frequent attacks of soreness over the gallbladder region, severe shaking and high fever. I often visited her but since I was not attending her, I gave no advice. However, I found her doctor there one day and told him before her how the gallbladder could probably be emptied. He believed it could not be done. Several weeks later I visited the woman and noticed that her skin was no longer yellow. She said she felt fine and had emptied her gallbladder. She had eaten scarcely nothing during her illness and the skin on her arms was very loose. I told her she should empty her gallbladder every day. She has now been doing that for two months and is quite like her former self.

GEORGE E. BARNES, M.D.,
Herkimer, New York

Protein Deficiency, a Hazard in Surgical Patients, Reversed with Nilevar®

With surgery made safe for the patient, the patient may now be made safe for surgery.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*COMPLETE DATA IN ORIGINAL ARTICLE (Rhoads, J. E.: Internat. Abst. Surg. 94:417 (May) 1952.)

Patients about to undergo extensive surgery[1] frequently have negative nitrogen balance and protein deficiency. And after any severe trauma, including extensive surgery, the rate of protein breakdown is increased.

It is also well recognized that patients with a strongly negative nitrogen balance are much more prone to suffer delayed wound healing[2], secondary infections[3], shock[2] and delayed convalescence[4].

The need for an effective protein anabolic agent is stated by Moore and Ball[5]—"there is one unbreakable rule of surgical convalescence: to complete his recovery, regain strength and return to work the patient *must* come into positive nitrogen balance."

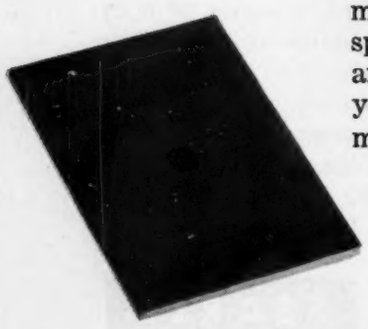
Nilevar (brand of norethandrolone) is a new anabolic steroid which rapidly and effectively reverses or diminishes excessive protein catabolism and nitrogen loss accompanying major surgical procedures. The protein anabolic activity of Nilevar is specific. There are usually minimal or no androgenic side effects.

In addition to its use both preoperatively and postoperatively, Nilevar is indicated in all conditions in which excessive protein catabolism (nitrogen loss) hinders or delays convalescence:

Recovery from pneumonia, poliomyelitis, severe burns and fractures, and in the care of premature infants, decubitus ulcers and wasting diseases such as cancer and tuberculosis.

The daily adult dose is three to five Nilevar tablets (30 to 50 mg.). For children the daily dosage is 1 to 1.5 mg. per kilogram of body weight for the first ten days of treatment, after which the daily dosage should be reduced in all prepuberal patients to 0.5 mg. per kilogram of body weight. Individual dosages depend on the need for and the response to therapy. G. D. Searle & Co., Chicago 80, Illinois. Research in the Service of Medicine. References supplied on request.

SEARLE



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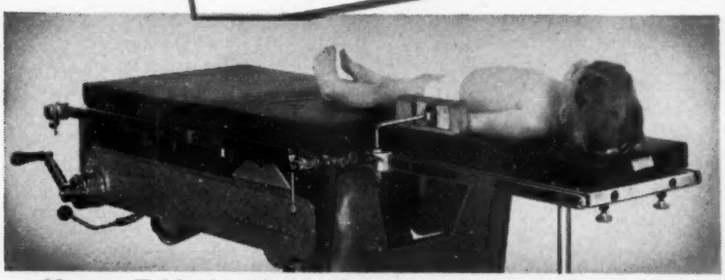
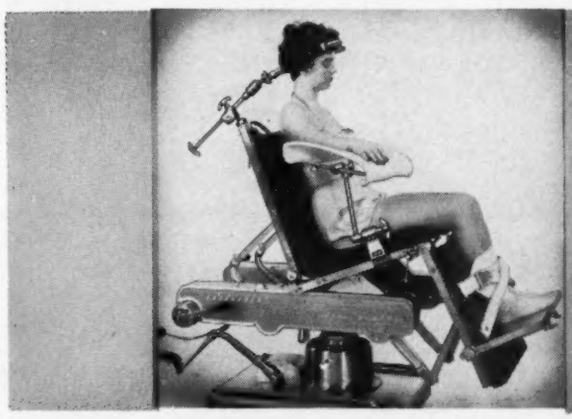


Narrow Table Attachment for infant surgery and head and neck surgery permits surgeon ideal proximity to operative site.



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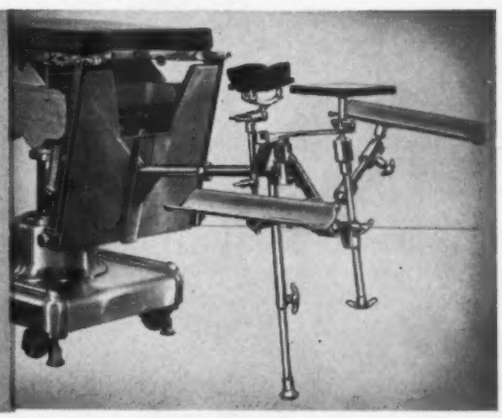

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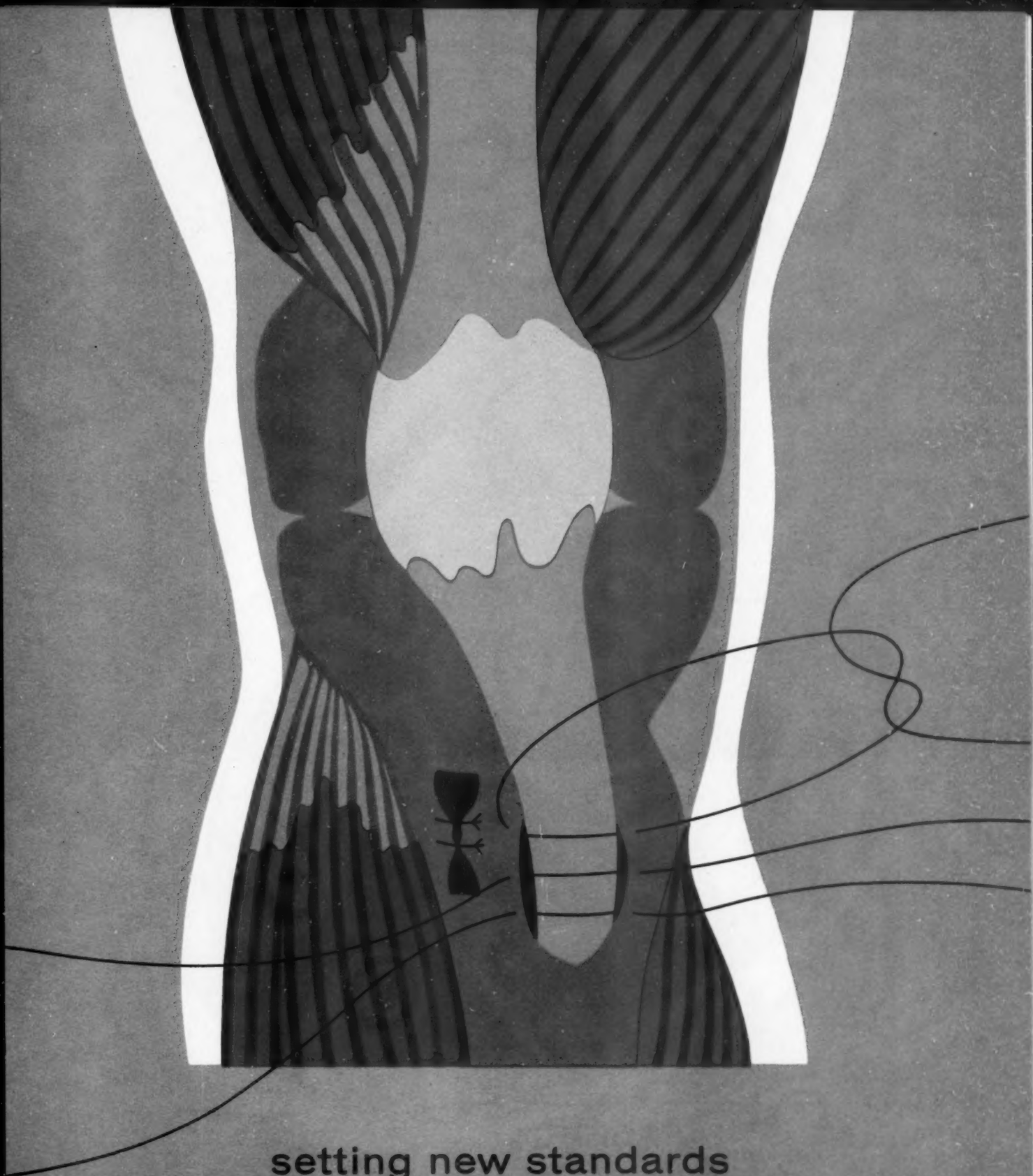

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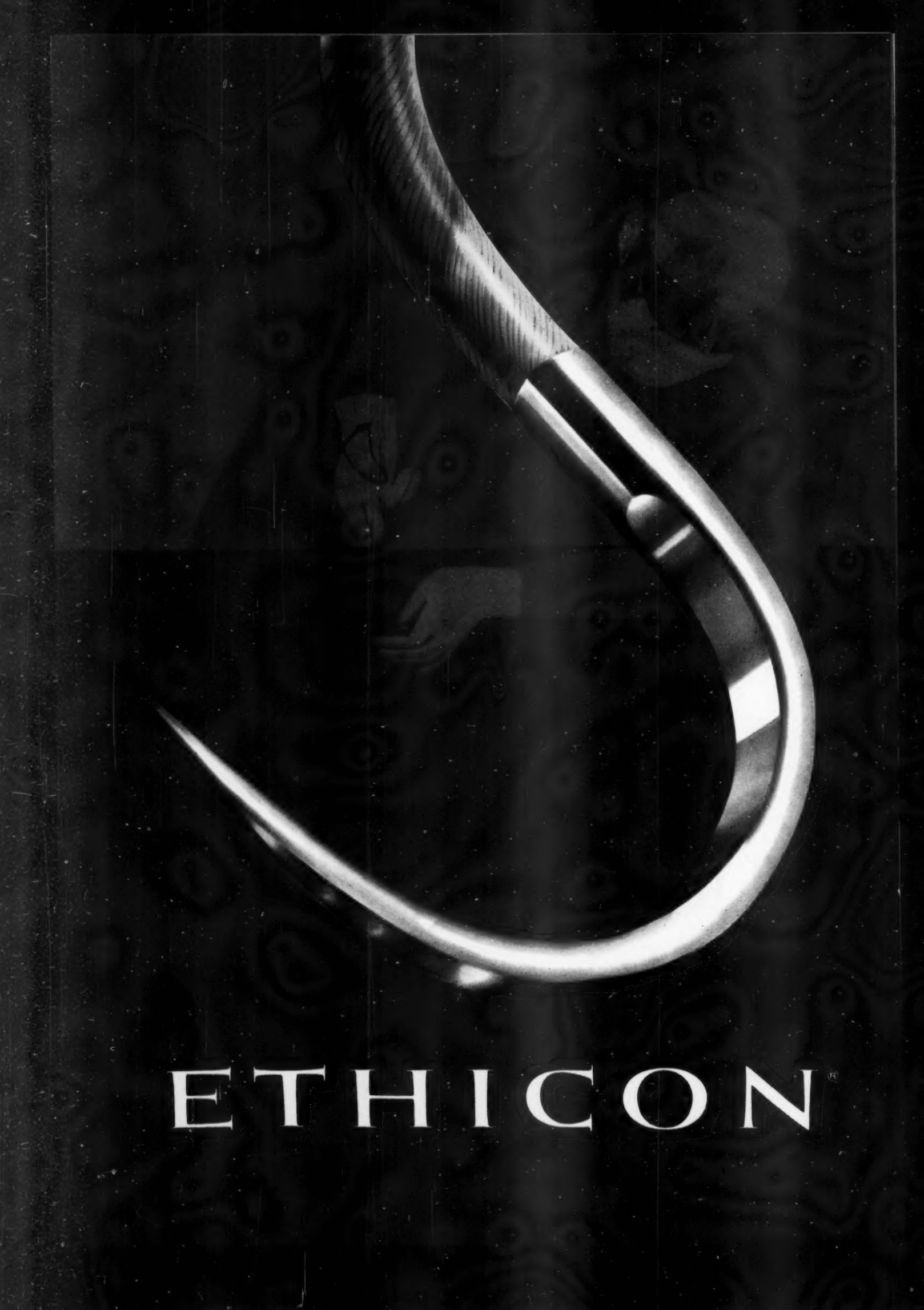
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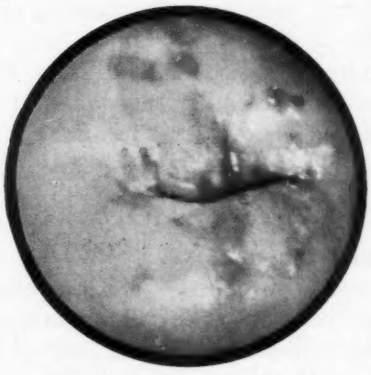
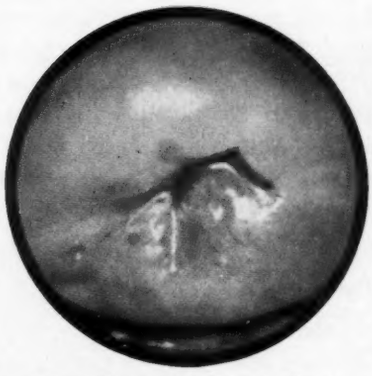


2 weeks post-cauterization



3 weeks post-cauterization, healing nearly complete

PHOTOGRAPHS BY SCHWARTZ, J.: AM. J. OBST. 63:579, 1952.

FACILITATE HEALING

after electrosurgery for cervicitis in cancer prevention

There is a "... wealth of statistical proof that chronic cervicitis is an important predisposing factor in the development of cervical carcinoma ..."[1]:

No. cases cervicitis	Treatment	Developed cancer	Followed
1,000	wide conization	0	2-14 years
1,408	cauterization	0	3 years
2,985	cauterization or diathermy	0	10 years
1,150	cauterization	0	not stated[1]

Electrosurgery is treatment of choice in long-standing cervicitis.[2] When purulent discharge and inflammation are present, treat with FURACIN Vaginal Suppositories before electrocautery.[3] Afterward, use them to prevent infection and accelerate healing.[4]

FURACIN VAGINAL SUPPOSITORIES facilitate healing by control of surface infection. They form a lasting bactericidal coating over cervix and vagina. Effective in blood, pus and vaginal debris. Nontoxic to healing tissue. No staining or leakage. Safe for prolonged use.

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FORMULA: 0.2% FURACIN in water-miscible base; hermetically sealed in yellow foil.

1. Crossen, R. J.: Diseases of Women, St. Louis, the C. V. Mosby Company, 1953, p. 509. 2. Novak, E., and Novak, E. R.: Textbook of Gynecology, Baltimore, The Williams and Wilkins Company, 1952, p. 220. 3. Patterson, J. F., Jr.: North Carolina M. J. 17:165, 1956. 4. Schwartz, J.: Am. J. Obst. 63:579, 1952. 5. Schwartz, J., and Nardiello, V.: Am. J. Obst. 65:1069, 1953.

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NOTES AND QUOTES

AN understanding of chemical changes that cancer might produce in a patient's tissues and body secretions could be important in several ways in the battle to control cancer. It could lead the way to a test of susceptibility to cancer and provide a basis for a simple, accurate diagnostic test of the incipient stage or of the early stages prior to dissemination of the disease. It could also provide new clues in the search for therapeutic drugs for cancer.

One approach that suggested itself was to investigate the relationships between the adrenal glands and cancer. Changes in the excretion pattern of corticosteroids (adrenocortical hormones) have previously been observed in the presence of cancer of the adrenals, pituitary, prostate and breast. It is important to know whether the excretion pattern of these hormones also changes in the presence of cancers of other sites, particularly those not directly related to the endocrine glands.

To obtain such information, scientists at the National Cancer Institute have studied some newly discovered corticosteroids excreted in the urine of cancerous guinea pigs. The findings are reported by Drs. Eli M. Nadel and Shlomo Burstein of the Laboratory of Pathology in a paper, "Urinary Excretion of Corticosteroids in Guinea Pigs with Malignant Diseases," which appeared in a recent issue of the *Journal of the National Cancer Institute.*

Surgical removal of parts of both lungs of patients with tuberculosis appears to be "safe and practical" in selected cases, according to Abraham Falk and N. Kenneth Jensen of the Veterans Administration Hospital and the University of Minnesota, Minneapolis, who discussed a series of sixty bilateral resections in The American Review of Tuberculosis and Pulmonary Diseases.

The resections in one instance consisted of the removal of one lobe of both lungs; in nine patients an entire lobe was removed from one lung and a segment from the other, while in six a lobe and a subsegment were removed. In the rest of the patients the amount of tissue removed from either lung was not more than a segment. The operations were performed in two stages, following a course of chemotherapy, with the interval of approximately a year in the earlier cases reduced in later ones to from six to eight weeks.

There were no deaths from the operations among the group and the significant surgical complications were few, according to the authors, who state that "bilateral resection offers an additional therapeutic approach in selected cases in which sputum 'conversion' has not been achieved by other methods of therapy."

A SECOND conference on Cerebral Vascular Diseases to be held in Princeton, New Jersey (Nassau Tavern), under the sponsorship of the American Heart Association has been announced by Dr. Irving S. Wright, New York, the Conference Chairman. Attendance at this conference, which is to start on January 16th and to continue into January 18th, will be by invitation only.

The conference will follow the pattern set by its predecessor held in 1954. It will be conducted as a series of round table discussions involving approximately forty participants. All discussions will be transcribed, edited and published as Transactions. These will be made available to the medical profession.

Among the disciplines to be represented at the conference will be pathology, brain chemistry, physiology, blood coagulation studies, neurology, neurosurgery, psychiatry, electroencephalography and studies in the fields of hypertension, atherosclerosis and rehabilitation.

Grants from the National Heart Institute and the Albert and Mary Lasker Foundation will help to underwrite the expenses of the conference.

"Landmarks in the History of Hygiene," by the distinguished medical historian, Henry E. Sigerist, was published recently by the Oxford University Press. In this brief, cogent survey of changing concepts of public health Dr. Sigerist highlights developments in the field from Galen to the present day. He discusses the famous medical school of the Middle Ages at Salerno, the Renaissance writings of Cornaro on longevity, and the writings and work of the eighteenth century pioneer of public health, Johann Peter Frank. In his concluding chapter Dr. Sigerist considers modern health problems.

Dr. Sigerist formerly occupied in succession chairs of the History of Medicine at the University of Leipzig and at The Johns Hopkins

CONTINUED ON PAGE 40

PAIN-

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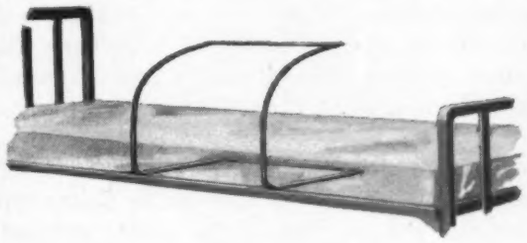

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University. He now lives in Switzerland and is Research Associate in the History of Medicine for Yale University. The first volume of his monumental "History of Medicine"—"Primitive and Archaic Medicine"—was published in 1951. He is also the author of "Medicine and Human Welfare," "Civilization and Disease," and "The University at the Crossroads."

THE ASEPTIC-THERMO INDICATOR CO. announces two new products: a needle holder and a catheter holder. The needle holder prevents dulling of the needle or damaging of the package, envelope or tube in which needles are processed. The design is adapted for speedy handling. The new holders can be used with any sterilizing technic.

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If you have a peptic ulcer, beware of an operation for pulmonary tuberculosis. This advice comes from the London Chest Hospital, England.

In a paper published in a recent issue of The American Review of Tuberculosis and Pulmonary Diseases, *J. G. Callanan of the English hospital discusses the development of a complication of the ulcer in fifteen patients with peptic ulcers following surgery for pulmonary tuberculosis. The patients were among twenty-seven being treated for pulmonary tuberculosis who also had ulcers of the stomach or duodenum.*

"Once a complication, particularly gastrointestinal hemorrhage, has developed," states Dr. Callanan, "a grave emergency is present. The bleeding ulcer may not be easily controlled. Prolonged parenteral blood and other therapy beyond a few days may lead to severe biochemical disturbances in patients already ill from a thoracic surgical procedure. If a partial gastrectomy becomes necessary, a deterioration in the tuberculous lung condition is almost certain to follow."

THE outlook in poliomyelitis, both immediate and long range, appears favorable, according to the statisticians of the Metropolitan Life Insurance Company. Through the first eight months of 1956, reported cases of the disease were 45 per cent fewer than in the comparable period of 1955.

An outstanding feature of the long-term poliomyelitis trend, say the statisticians, is a pronounced shift to the older ages. The disease now claims more of its victims among older children and among adults up to age thirty-five than it formerly did, according to the mortality experience of the insurance company's industrial policyholders.

The shift in the age pattern may result primarily from a rise in the age at which natural immunity is acquired, possibly reflecting lessened frequency of exposure among children. A sharp drop in 1955 in the frequency of hospital admissions of patients with paralytic poliomyelitis at ages seven and eight, it is noted, coincided with the wide use of the Salk vaccine at those ages.

Duke Hospital's new $3,386,000 *seven-floor addition is now entering final stages of construction and is expected to be completed by March, 1957. Under construction since January, 1955, the addition will provide* 109 *new beds, expanded outpatient facilities designed to relieve present crowded conditions and many improvements in existing services.*

The addition will bring the total number of beds to 668, *making Duke Hospital second in size only to Johns Hopkins among private general hospitals in the South.*

REPRESENTATIVES of Canadian government, industry and health professions joined Parke, Davis & Company, Ltd., at Brockville, Ontario recently, in dedicating the pharmaceutical firm's new $2,000,000 Canadian laboratories. A tour of the laboratories, which occupy 20 acres and have 150,000 square feet of floor space, followed the dedication. Construction of the new laboratories was singled out as another "milestone in the 70-year history of Parke, Davis in Canada." The new facilities will provide Canada's pharmacists, physicians and hospitals with faster and more efficient service.

CONTINUED ON PAGE 42

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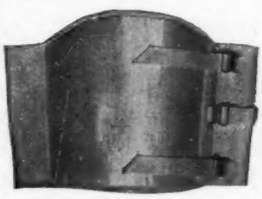
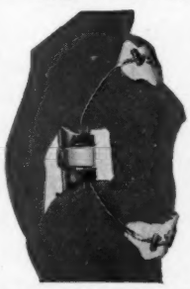
Made from white woven elastic with front panel of foam rubber vulcanized to tackle twill, faced with flannel for comfort. Three alternating buckles and straps for side closing. The high top of the front panel can be reversed for low abdominal incisions.



CAMP Spinal Hyper-extension Brace



A new washable and odorless Camp brace for positive hyper-extension in cases of compression fractures, osteoporosis with kyphosis, Marie-Struempell's disease and adolescent epiphysitis. Easily adjusted, rotating pads at sternal and pubic areas to eliminate pressure edges.

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NOTES AND QUOTES

Pyrazinamide, the drug which has marked activity against tubercle bacilli but often causes damage to the liver, can be used in combination with isoniazid in low dosages for short-term therapy in selected cases.

This conclusion was reached by Stanton T. Allison of the Veterans Administration Hospital, Rutland Heights, Mass., following a study involving 123 patients. The combination of pyrazinamide and isoniazid has been found to come closer to eradicating tubercle bacilli from lung tissue than any other known drug therapy. It has been used cautiously, however, because of the danger of liver toxicity. The study was undertaken to find out if this danger could be avoided by the use of low dosages of both drugs. Of sixty-six patients who had completed eight months of treatment at the time of the report, thirty-eight were on a regimen of pyrazinamide-isoniazid and twenty-eight were "controls," receiving streptomycin-PAS.

On the basis of x-ray improvement, cavity closure and sputum conversion, Dr. Allison draws the conclusion that pyrazinamide-isoniazid in the low dosage used is "an excellent short-term" (not more than eight months) regimen, provided the patients are carefully selected to exclude those with a past history of "hepatitis, cirrhosis of the liver, or chronic alcoholism."

THE Annual Meeting of the Southern California Chapter of the American College of Surgeons will be held at the Biltmore Hotel in Santa Barbara on January 18, 19 and 20, 1957. Approximately forty papers will be read by local doctors and panel discussions on cancer of the breast and disorders of the gastroesophageal junction will be presented. The guest speakers will be Dr. Alfred Blalock, Professor of Surgery at Johns Hopkins University and Dr. Henry Harkins, Professor of Surgery at the University of Washington.

The Public Health Service has reported a marked increase in the number of people drinking fluoridated water to help protect children's teeth against decay. The latest tabulation by the Public Health Service shows that fluoridated drinking water is now furnished to one-fourth of the people using public water supplies.

During the first nine months of 1956, communities with a combined population of six million started fluoridating their water. This compares with an average annual increase of four million from 1951 through 1955.

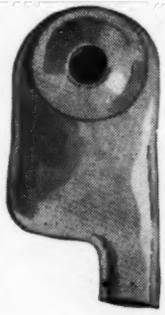
About 1,400 cities and towns with a total population of over thirty million people were using fluoridation at the end of September, 1956. Among the larger cities adopting this preventive dental health measure are Chicago, Philadelphia, Baltimore, Washington, Pittsburgh, Cleveland, Milwaukee, San Francisco, St. Louis and Buffalo.

In 1946 fluoridation was used in twelve communities with a total population of only 328,000. By the end of 1950, one and a half million people in ninety-four cities and towns were drinking fluoridated water.

At the end of 1955 about half the communities with over 500,000 population and one-fourth of the towns with between 10,000 and 500,000 population were fluoridating their water. Only 5 per cent of the communities of less than 10,000 population were known to be fluoridating at the end of 1955, when some 16,000 smaller cities and villages were not using the tooth decay preventive in their water supply.

DR. LOUIS N. KATZ of Chicago, internationally renowned research scientist and educator, received the 1956 Albert Lasker Award of the American Heart Association "for distinguished achievement in the field of cardiovascular research." Dr. Katz has been Director of the Cardiovascular Research Department, Medical Research Institute, Michael Reese Hospital, since 1930 and Professorial Lecturer in Physiology at the University of Chicago since 1941. A former President of the American Heart Association, Dr. Katz is currently President of the Chicago Heart Association.

The Bard-Parker Co., Inc., of Danbury, Connecticut, recently announced the production of Halimide, a new concentrate of low surface tension and penetrating qualities, scientifically perfected for instrument disinfection. This product is bactericidal, non-selective and tuberculocidal when diluted with alcohol. It is also non-corrosive, stable and inexpensive (1 ounce makes 1 gallon of solution). Price: $2.50 for a 4 ounce bottle.



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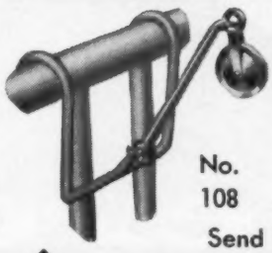

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